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R. H. STINCHFIELD, *Managing Editor* SID NOBLE, *Editor*

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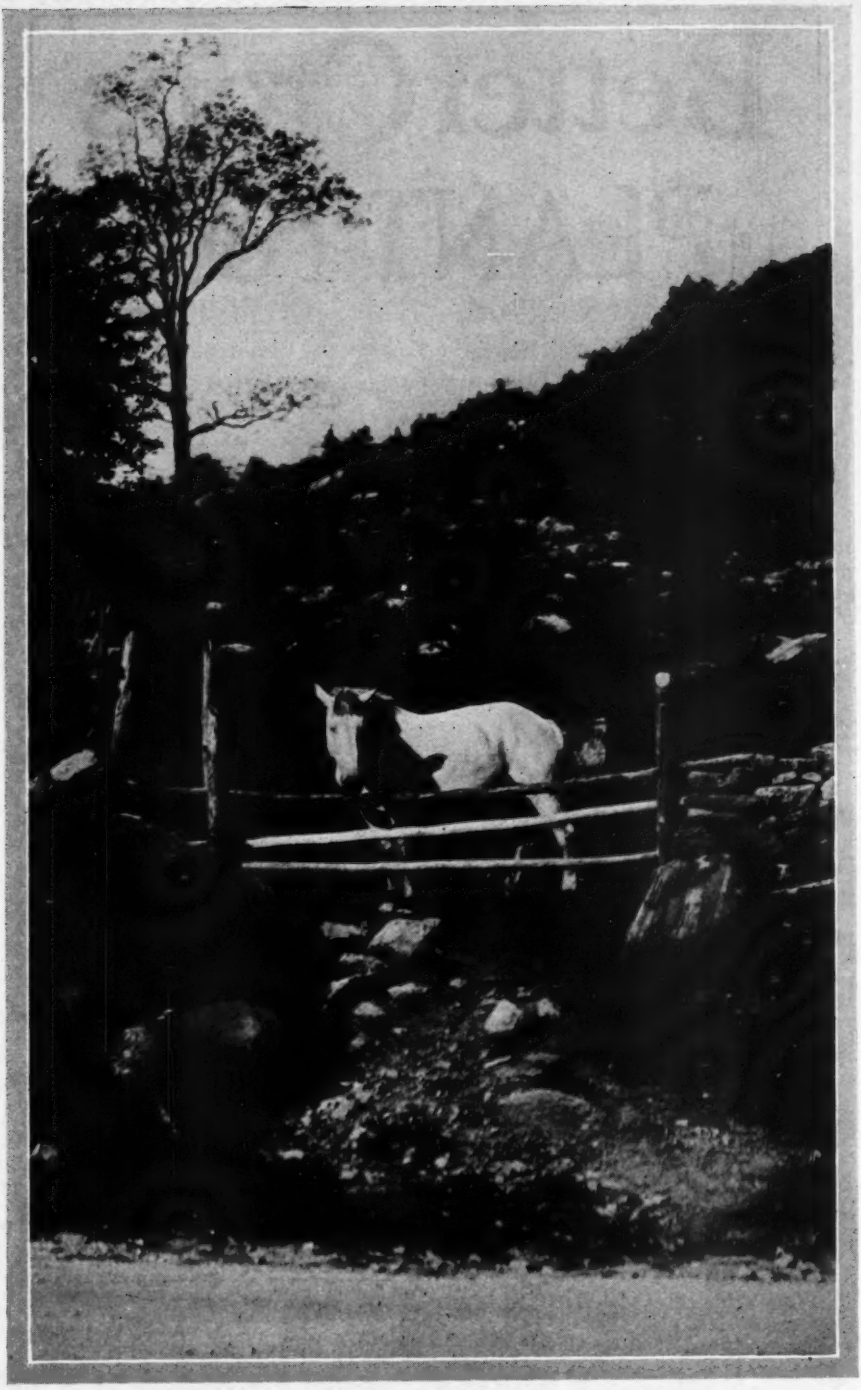

SUNSET ON COOL FALL NIGHTS FINDS THEM READY FOR A COZY BARN.

Better Crops with PLANT FOOD

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Hardscrabble GRIT

By Jeff McDermid

THERE are Master Misfits as well as Master Farmers. At my last appearance I related something of the background and the experiences surrounding an old acquaintance of mine who had earned the title of Master Farmer on an estate that had been in his family for three generations.

Perhaps you recall that the Permanence and Stability of Agriculture was the motif I discerned woven into the fabric of his career. Since then I have discussed many phases of his recent distinction and have learned that the maintenance of the title of Master Farmer is quite as touchy a job as the earning of it in the first place. That is, he acquired the honor by a slow and unconscious process which was as much a part of his life as the seed time and the harvest; while now that he has won the medal with all its real and fancied glory, it sets him up as a sort of universal target for all the critics of Christendom to aim at.

Yet he bears up under the load of enforced obligation decidedly well for a man past three score and ten years.

If I were choosing Master Farmers as a steady occupation, probably I should pick the elderly gentlemen of the profession. They have usually gone far enough on the road to get a true sense of values, and they have too short a span ahead of them to threaten the community peace of mind by many years of insufferable egotism.

AT this time I am changing the theme to stress for awhile the case of the unsophisticated, patient, primitive Master Misfit, the kind of submarginal land farmer who adds to the surplus in years of universal plenty and suffers with woe in the seasons of drought and want. His spirit may seem on the surface to be broken and his aspect timid, but deep down below the crust of his misery there is a kind of pitiful nobility, an echo of things that might have been.

I have called my theme the story of Hardscrabble Grit, because no other combination of phrases seems to fit the peculiar instance I have selected from my store of actual examples. It occurred in my own state and seems worth relating in some detail.

I have taken it out of the dusty files because it points to a childish faith in the future that many of the powerful Master Farmers themselves entirely lack. It embodies hope when the reasons for it were indeed slim and illusory. Although my primitive friend lives in an age of blase sophistication and modern turmoil, he has charted his course along the pathway of the covered wagon instead of tying himself and his ambitions to a trimotor plane.

At the age of forty-nine years this Master Misfit hero of mine resided on a farm of seven acres situated on a bluff that would have made fine pasturage for the joker's "side hill cattle." He sold honey, apples, and broilers, but the well water gave out finally and he lacked the price of a drilled well. Sickly and rather bent for his years, this primitive hero proposed to his family that they seek government land somewhere so as to get away from the beetling bluffs and the stagnant water.

Uncle Sam's generous land office mailed him a budget of information. He found that there was a parcel of unoccupied homestead land right within our own state, a state all nicely skimmed over and snugly settled by provident Germans and Norse. This delighted the family for could they not return sometimes to gossip with old cronies? Thereupon he took a five-cent school tablet and wrote to the surveyors in the adjacent county where this vacant land was located.

Finally on one momentous morning Mother ironed his shirt and tied his faded neckband, packed his Victorian valise and waved him a confidential farewell. Here he sallied forth, a knight of the unbelievable romance, aged forty-nine years, with failure behind him and unblasted courage in his heart, as keen for the primitive adventure as any of the braw lads who founded an empire.

Arrived at the pickle station where the county court house was located, our friend first sought the surveyor, who found him a driver who would take him to the potential farm at a price within his means. Had he not really needed a guide who knew the sand dunes well, our friend would have walked and saved the difference for a tid-bit for the kids. Anyhow, he jogged out in a decrepit Ford with his talkative native driver, who informed him that there was no land there which was vacant unless there was a reason for it.

OUT of about two forties, with plenty of wood and water, he found that at least thirty acres might be plowed. It is significant to note that he, like scores of our own pioneering ancestors, sought wood and water as the first requisites of a home. Back home went our hero, reported to his

(*Turn to page* 61)

Some members of the Soil Congress inspecting experimental plots of the Institute for Fertilizers, near Moscow. Director Erhard Britzke is the center of the group.

Better Crops in Russia

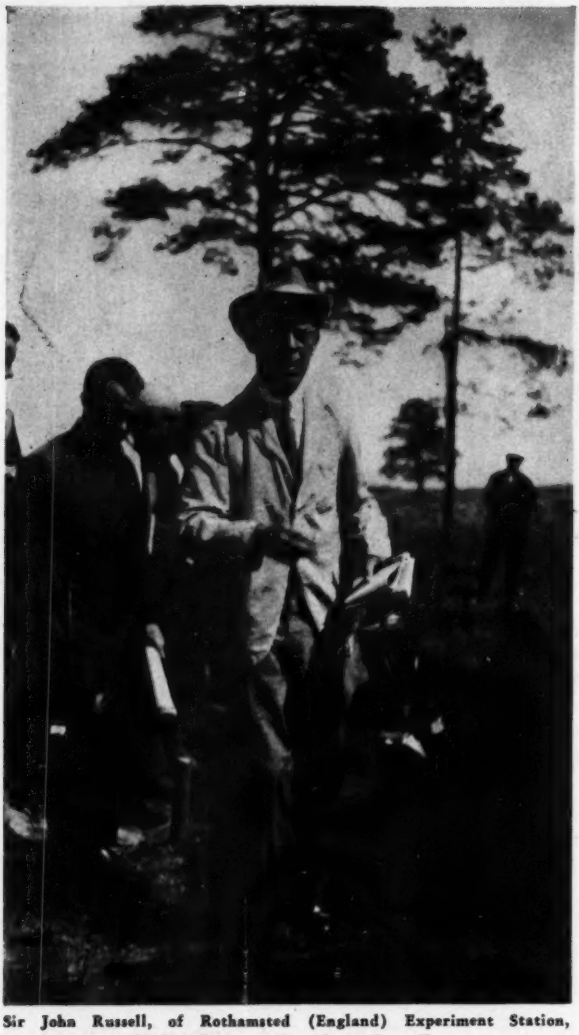
By A. B. Beaumont

Head of Department of Agronomy, Massachusetts Agricultural College

THE Union of Socialistic Soviet Republics has recently entertained its first international congress. From the four corners of the earth came representatives, more than 600 in all, of those nations which are most interested in the advancement of soil science. Our own country, having at present no official diplomatic relations with the U. S. S. R., had no official representatives, but, strangely, had the largest number of delegates from a foreign country. Moreover, we were welcomed as cordially and treated with as much consideration as any other group of foreigners.

The Second International Congress of Soil Science was opened July 20 in the Academy of Science, Leningrad. Professor N. I. Vavilov, in extending the welcome of the Soviet Government, said in part:

"Science is international. Russia and science are inseparable. The chief task of the Government is to increase the prosperity of the country. Experiments have shown that big state farms and collective farms are the only real solution of the agricultural problem. The possibilities of agricultural development are enormous.



Sir John Russell, of Rothamsted (England) Experiment Station, finishes the inspection of a soil profile.

> Only about 5 per cent of the whole country is under cultivation. It is not difficult to double this area."

Sir John Russell, director of the famous Rothamsted agricultural experiment station of England, and the newly elected president of the International Society of Soil Science, said in response:

> "Science knows no boundaries, either by nation or by class. A man is judged by what he is worth and what he has done."

The character of the papers presented to the Congress by the Russian members, personal interviews with them, and the inspection of their laboratories left no doubt in the writer's mind as to the high quality of Russian agricultural science. Particularly in that branch of soil science known as the genesis and morphology of soils, the Russian workers are acknowledged leaders. This fact was emphasized by the wonderful collection of soil monoliths which formed important parts of the fine exhibits both at Leningrad and Moscow. In soil chemistry and plant nutrition, the Russian scientists have made noteworthy contributions.

The writer holds no brief for the present Soviet economic policy, nor does he venture any prediction as to the future of the Soviet government, but he does know that in Russia there is a group of well-trained, enthusiastic scientists who are prepared to give the best of the world's science to Russia's gigantic agricultural enterprise. Further, there was strong indication that the Soviet government intends to leave no scientific stone unturned in order to make its agricultural enterprise a success.

Let us notice some details with reference to the policy toward agricultural science. For example, there is the Institute of Applied Botany, headed by Professor N. I. Vavilov, a member of

the Leningrad Academy of Science. Director Vavilov, a man of striking personality, has travelled widely in connection with this work and even now is on an extended tour in our Southern States for the purpose of studying our sub-tropical agriculture. The institute has a far-flung program regarding the introduction and breeding of crop plants of all kinds, best adapted to the soils and climatic conditions of Russia. It was here that I met Professor T. A. Krasnosselsky-Maximov, and over a cup of "chaij" served in the Director's office, discussed with her the work which she and her husband are doing on the problem of drought and cold resistance of cereals. This institute has its headquarters in Leningrad, 200 branch stations in different parts of the Union, and a staff of 900 technical workers. The budget for the present year is 4,000,000 rubles, and next year it will be 11,000,000 rubles.

Then note the extensive Institute for Fertilizers with headquarters at Moscow. This institute, said Director Erhard Britzke, who was educated in Germany and speaks German fluently and English fairly well, was organized three years ago and housed in a building designed to accommodate a staff of 170. The building actually houses now, during the winter months when the field men are in Moscow, a staff of 800. A new building with a capacity six times that of the present one is being built in Moscow. The Institute for Fertilizers is a comprehensive organization, embracing four sub-divisions: 1. Mineralogical-geological. 2. Chemical-technical. 3. Agricultural-technical. 4. Economical. All activities concerning the mining, manufacture and use of commercial fertilizers are here organized under one administration. Theoretically, there will be perfect coordination of the various branches of the service. For example,

A group of soil scientists inspects the profile of a podsolized soil near Moscow.

there will be no overproduction of any particular kind of fertilizer, each being produced as needed. As an example, di-calcium phosphate has been found to give better results than other phosphates on the sour, podsolized soils. Therefore, it is planned to make certain quantities of di-calcium phosphate for the zone of podsolized soils, and to distribute only this kind in that zone.

Russia is very fortunate with respect to natural supplies of raw materials for the manufacture of fertilizers. She has extensive deposits of phosphorites which, however, are in general of not so high a grade as those of the United States. On the other hand, she has what we have not yet found in this country, commercially workable deposits of potash salts. The full extent and nature of these valuable stores of phosphates and potash are not known. Fifty to sixty prospecting parties are kept in the field for the purpose of securing additional information as to the nature of fertilizer resources.

According to Director Britzke, it has been estimated that 21,000,000 metric tons of fertilizer are needed to furnish only a light application to land expected to be cultivated in the near future. At present, Russian fertilizer plants have a producing capacity of 3,500,000 tons, and the five-year plan calls for a production of 12,000,000 tons in 1933. The budget of the Institute for Fertilizers was 5,500,000 rubles in 1929, 10,000,000 in 1930, and 18,000,000 to 20,000,000 rubles are expected in 1931.

Thus agricultural research and experimentation are going ahead in Russia to an extent and degree of thoroughness unsurpassed in any country of the world. The Soviet Government has projects for agricultural research that would stagger our State and Federal research institutions. Further, the Government appears to be unreservedly supporting its scientific institutions on which rests the burden of correct guidance of the agricultural program.

The Five-Year Plan

In Russia one hears a great deal about the Five-Year Plan, which was approved in May, 1929. According to this plan, all major activities of production and industry, including agriculture, are to be coordinated and regulated. On paper at least, such a plan is ideal from many standpoints, but no one knows how it will eventually work out. There is consider-

Headquarters of the Soil Congress at Hotel de Europe, Leningrad.

Typical Russian village of northern Russia. Note thatched roofs and "strip" farming.

able enthusiasm back of it, and no doubt a degree of success has attended it within the two years it has been under way. In fact, it is now claimed that the major agricultural goals will be attained in four years instead of five.

There are, of course, many difficulties in the way of the execution of such a Gargantuan plan for the management of a great nation's business, difficulties which to some seem insurmountable, and which are well recognized by the Soviet leaders. Not the least of the obstacles, possibly the most stubborn, are the human problems. These become especially acute when dealing with the enormous peasant class which in some sections is only semi-civilized, in others leads nomadic lives, and speaks many languages and dialects but reads almost none. But it is important to have a plan for agriculture, even though it be faulty in some respects.

Collectivizing Farms

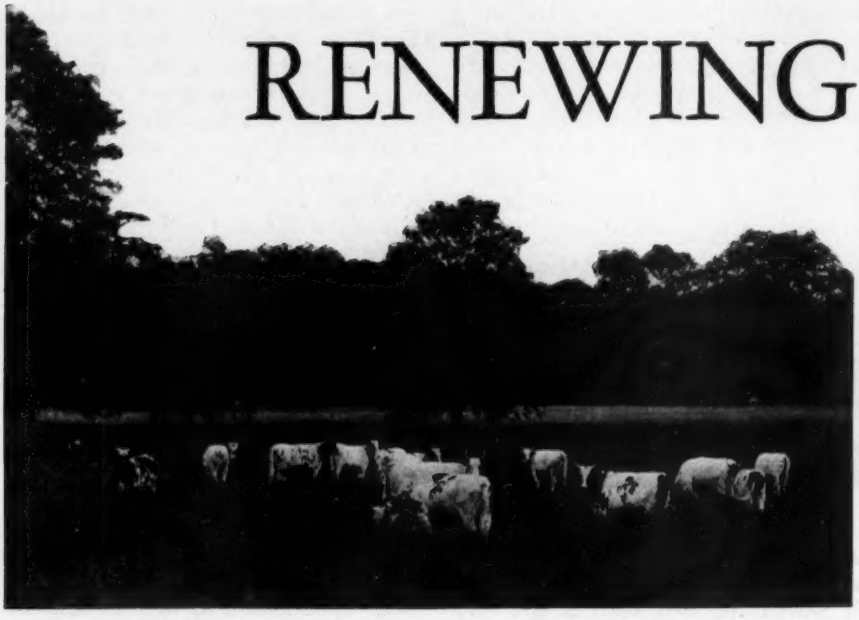
One of the principal handicaps to profitable Russian agriculture is the "strip" farming of the peasants. A typical farm contains only 15 to 20 acres, and this small total area is often divided into small narrow strips adapted mainly only to hand labor. Practically, the Government intends to collectivize these small units into large units known as the "kolhoz" or collective and introduce the use of machinery on a scale equalling if not surpassing anything of the kind done in our West. The gasoline tractor is the idol of the Soviets. With the tractor they expect to turn farming "upside down." They expect to "out-America America," and in the course of 5 or 10 years accomplish by orders from Moscow what our farmers have worked out through two or three generations.

The Soviet Government has prepared the way for a legal approach to the problem of collectivizing the farms by nationalization of the land. Quoting from M. M. Volf, Chief of the Agricultural Section of the Gosplan (Planning Board): "Soviet law knows no other land owner but the State. . . . This law, according to the conception of the Communist party, has to become the fundamental condition of the socialistic reorganization of agriculture—of the transformation of minute, atomized peasant farms into vast socialized agricultural enterprises."

Further, states Volf: "The per cent of collectivized rural population now

(*Turn to page 60*)

RENEWING



Both herd and pasture express contentment.

PLANTS like humans and animals must be fed. That, today, is almost a self-evident truth to any schoolboy. In the course of time crops deplete the manger of soil fertility in the same sense that a herd of cattle depletes the store of harvested feeds through the longer winter months.

There must be a living wage provided for both livestock and the crops they consume, if each is to prosper. Successful cropping of the soil has always been the prelude to profitable livestock management. The one must feed and maintain the other, and because of this relationship there may be deduced the primary truth,—food for crops means feed for livestock. In short, a living wage paid to crops guarantees the same for the herds. This principle has always been the backbone of winter feed production. Lime, legumes, and manure have long been the pioneer, soil fertility slogan. From these three servants there has been reaped a bountiful crop prosperity.

But even these, the "big three," have failed to maintain the level of soil fertility sufficiently high and well balanced to keep production costs of many crops within practical limits. The use of commercial plant foods for arable crops is getting to be a well-known necessity over a wide stretch of country. The "big three" are now giving way to the "big four." The lesson of rotational cropping and soil fertitlity for machine-harvested crops has been pretty well learned. Lime, inoculation, and manure used to be the only alfalfa sermon preached. Today we find a phosphate-potash chapter has been written for this crop.

I wish it could be said that all of the crop servants were managed as carefully as alfalfa. We have taken mighty good care not to arouse her spunk, for it is only too well known the penalty would be a low production peeve. She stated her demands emphatically at the time she hired out, and several salary raises have already been granted since first she started to serve the dairy industry. Her royal majesty has ruled with a firm hand.

PASTURE LEASES

By George B. Mortimer

Professor of Agronomy, Wisconsin College of Agriculture

And similar recognition has been accorded her sister, the corn crop. The morale of these two servants has been maintained at high levels, and today they are serving the livestock interest better each year.

The most neglected crop servant on the average farm is the natural pasture. Browbeaten into an inferiority complex, until now too anemic even to protest intelligently, she has unjustly been dubbed the Cinderella on the stage of crop actors. Patience and long suffering have been her virtues. Destitute and poverty stricken, she hides shamefacedly between her haughty sisters in a stubborn attempt to maintain the only domain she has now long known,—the ash corner of the farm. Tortured beyond endurance, bewildered by hunger, weeds, and all sorts of vagrants, trampled and eaten to death, she has dutifully bided her time for the dawning of the day when the fairy prince would arrive to again fit to her royal foot the jewel studded slipper of fertility, and to proclaim to all the world her return to the throne of pioneer days.

Such is the picture of a major portion of our natural grass lands. From the time they were snatched from the hands of our predecessors, their very life-blood has been drained to the point of exhaustion, until now nothing short of several fertility transfusions can ever hope to effect a permanent recovery from the hands of death now hovering over them.

Like many of her neighbors, the shoulders of Wisconsin's landscape are draped with thousands of acres of these sick pastures. It is estimated that at least 50 per cent of her summer milk production is produced from natural grazing lands. Can we afford

Learning to put the "Come-back" into pastures.

to continue to hasten their abandonment from the realms of grazing lands,—to be returned in the course of long years to brush and timber? For the majority the answer is no. It is now being realized that they may easily be returned to the magnificent verdure of their early history. All they need is a square deal. There isn't another farm crop that has suffered as much abuse as natural pastures. No other institution could last as long as permanent pastures have, if conducted along the lines of a "checking out method." Any machine will wear out, and pasture soils, like all others, are working machines and must be kept in constant repair.

Hunger Sickness

The only thing that ails the majority of them is hunger sickness. Anyone can tell that by watching the slow, stubborn, sickly growth of early spring quickly running into stemminess and seed heads with a minimum of vegetative growth. It is but a feeble attempt to conserve what energy there is left in propagating its kind. That is the way Nature works.

There are two sound remedies for this ailment; one, the return of life-giving properties to the soil through the magic wand of commercial plant foods, and the other, controlling the grazing of the herds. These are the two measures that must be incorporated into a program for managing pastures generally.

To be sure, there are many acres of these old pastures that never were worth much from the beginning. They do not have the natural setting for making good pastures. Thin soils, steep, rough hillsides that are severely afflicted with drouth, and low, swampy areas never have and probably never can produce good grass. I wouldn't recommend an ounce of fertilizer for such areas, for the natural setting they occupy makes it impossible to get returns for money invested. Fortunately however, these constitute a minority, for by far and wide the majority of these natural grazing lands are worthy of attention. Here in Wisconsin, we have some counties, 50 per cent of whose area is in permanent grass lands, and for many reasons had better be kept so than to be rotated in harvested crops.

In the spring of 1927, the writer started work with a decidedly worn-out pasture. It was platted into eightieth acre plats for fertility studies. Some notion of how poor it was may be had from the yields of the untreated or check plats at the close of that season, the average for all of them being but 807 pounds of dry matter an acre. This yield is extremely low when it is known that a good permanent pasture in a normal season is capable of yielding from 4,000 to 6,000 pounds of dry matter an acre. All plats were run in duplicate, excepting the checks which were replicated six times.

In the beginning of the experiment fertilizers top-dressed at these acre rates were used:—lime as ground limestone, 2 tons; 20 per cent superphosphate, 375 pounds; muriate of potash, 150 pounds; nitrogen as ammonium sulfate, 100 pounds; stable manure, 6 tons. Determinations for soil acidity and available phosphorus were made before the fertilizers were applied. The acidity reaction showed that two tons of lime would amply take care of natural pasture plant requirements. In all the readings taken, the soil showed but a trace of available phosphorus. The results for the first two years were quite disconcerting. While good percentage increases were had with some of the treatments, the total yields remained too low to be of significant value.

Consequently in the early spring of 1928, some of the treatments were repeated. Nitrogen was raised to 300 pounds of ammonium sulfate; phosphate again 375 pounds; and potash, 200 pounds. The table of data following gives the results to the close of the 1929 season, covering a three-year pe-

THE PASTURE LEASE MUST CONTAIN A FERTILITY CLAUSE

Treatment	Yields of Dry Matter an Acre					
	1927	Per Cent increase	1928	Per Cent increase	1929	Per Cent increase
Checks	807	...	982	...	1381	....
P	647	...	898	...	1377	....
P-L	926	14.7	1139	16.0	1963	42.1
P-K-L	863	7.0	1536	56.5	3484	152.0
P-K	990	22.7	1397	42.2	3502	153.5
N	886	9.8	1112	13.2	1422	3.0
P-K-L-N	1299	61.0	1630	66.0	3580	159.2
P-L-N	1206	49.4	1319	34.3	2091	51.4
Lime	569	...	1003	...	1591	15.2
Manure	926	14.7	1472	50.0	2066	49.6

riod. The yields are expressed in pounds of dry matter an acre.

As already stated and as shown by the data, renewed leases on our pastures must contain a fertility clause. Many of them have gone about as far as they can with what they originally had. They have run their race well and have earned thousands of dollars, and putting back what has been removed will enable them to enter the race again.

The Need for Potash

Most everyone who has been working with pasture problems has come to regard phosphates and lime as fundamental treatments for them. This I think is quite generally true. Reasonable increases are commonly obtained wherever they are used. Lime may not always be as essential as phosphate for pastures, but it is commonly found to be needed in varying amounts. There are, however, cases where lime and phosphates will not turn the trick for maximum returns. Such is the case of the pasture in this study.

Throughout the three years, phosphate alone has given no increase. With lime, however, there shows a 42 per cent increase for the third year. By the addition of potash, there has been 152 per cent improvement, and even without lime, phosphate and potash have given the same high return. The case for potash fertilization on this pasture is clean cut. Wherever it has been used, tremendous increases accrue. Take the case of phosphate, nitrogen, and lime. The increase at the end of the third year was 51.4 per cent, contrasted with 159.2 per cent where potash was used with them.

I suspect that this is typical of more cases than we are aware of. The assistance lent by potash to the encouragement of clovers, and the general beneficial tone it gives to the entire pasture vegetation, in my judgment, warrants its use in pasture fertilization. Liming alone when needed will effect some improvement, usually limited, however, and not felt before the third or fourth year following its application.

One might read from these results that there is not a good case for nitrogen on pasture lands. However, this would not be a fair interpretation, judging from results obtained on other pastures. This particular pasture was so very poor in mineral fertility that nitrogen has not been capable of showing much marked effect in yield increases. In fairness though, a larger percentage of the vegetation was grass wherever nitrogen was applied, while with mineral fertility, there has constantly been a preponderance of clover. Furthermore the distribution of feed throughout the season has been more uniform, when nitrogen was used.

(*Turn to page* 51)

Selling an Idea

"Seeing Is Believing" Is Again Demonstrated

By F. H. Jeter

Agricultural Editor, North Carolina State College of Agriculture and Engineering

Tobacco like this was seen throughout the Angier section.

DOWN the road came a string of cars. Since eleven o'clock that morning they had made their way along tortuous plantation trails, now in sand, then in clay, sometimes with the road sunken under over-hanging banks of yellowish, red soil, and again merging into the turn row of fertile fields. Mostly the cars were adapted to such roads for in them were about 300 farmers who had come to see and learn.

"I want you to join us next Friday," was a brief invitation given me by S. K. Jackson, one of the field representatives of the N. V. Potash Export My.

"What are you going to do?" I inquired.

"If you can spend the day on an interesting trip, be over at Patterson Hall at 10 o'clock Friday morning. We want to show your agronomy folks some interesting tobacco and we would like to have you go along," he replied.

"That doesn't mean anything to me," I answered. "I can see interesting tobacco any day and I am not going anywhere until I know what it's all about."

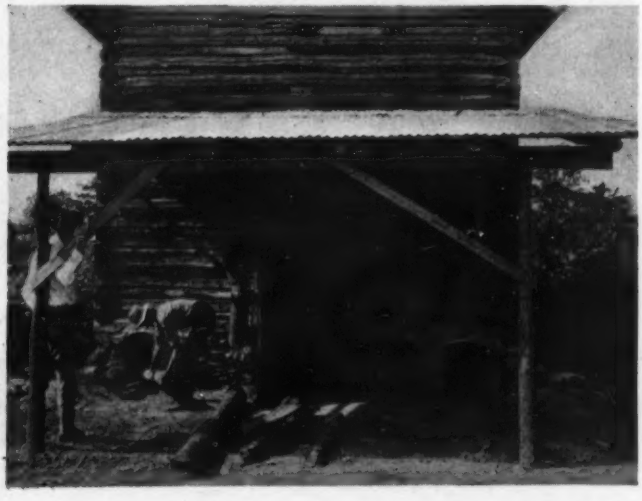
Mr. Jackson then took the trouble to explain. There is no better tobacco growing section in North Carolina, he

said, than in the territory about Angier, located near the junction of Wake, Johnston, and Harnett counties. The farmers are wide-awake and energetic. They are good tobacco growers and they grow good tobacco. This season he had located quite a few fertilizer demonstrations in that territory and since the results were showing how a well-balanced fertilizer would pay good returns, he had planned a field day. A committee of local citizens had mapped a route through some of the best farms and at the close of the trip, the party would enjoy a barbecue dinner. Where the dinner would be, he did not say, and no one knew until the grove was reached at late mid-day.

One was hardly prepared for the crowd at Angier. Not only were there College and Government research men present, but there were practical growers from at least a half-dozen counties. Dr. J. N. Harper and his entire southern staff were guests. After some waiting, the group separated into the various automobiles and the tour began. Stops were made at interesting points. Sometimes individual cars stopped and threw the whole caravan out of control, but this was not minded since there was something new and striking to see at nearly every point.

At the scheduled stops, the owners were present to tell how they fertilized their crop; what they thought of top-dressing with potash; and what they thought of the high potash content in fertilizer mixtures prepared according to the College recommendations. According to my notes, farms belonging to N. V. Stephenson, Dr. C. R. Young, D. F. Collins, J. E. Williams, W. O. Altman, J. M. Griffin, J. B. Upchurch, D. W. Denning, R. W. Lee, S. B. Currin, D. F. Adams, J. P. Gardner, J. P. Jones, E. M. Currin, C. J. Mabry, E. R. Mabry, and E. M. Stone were visited.

Along the route, the visitors could be heard making exclamations of interest and wonder. The one thing that impressed all apparently was the magnitude of the planting, the cleanliness and quality of the crop. Great fields containing up to 100 or more acres would be seen on some farms. In nearly every case the plants were of such uniform size that the ripple of a breeze would cause a play of leaves half upturned like the wavelets which play across the level surface of a lake in the quiet of evening. In some places, the owners had begun to prime the lower leaves, and constantly the tour passed tobacco barns shaded at one end with freshly cut branches of trees under which laborers or the families of the growers were tying the leaves to sticks for immediate curing. Throughout the area the pungent smoke of burning wood and the mellow aroma of yellowing leaf told of



The pungent smell of curing tobacco hung over the section and gave promise of the market days to come.

tobacco curing barns in operation.

Turning abruptly at a curve in the road, the caravan found spread before it such a sight as few will forget. Stretching out to the low-lying woods on each side were 100 acres of tobacco. There was no need to say "halt." The cars had stopped. Dr. C. R. Young, owner of the field, had planned to make a speech at the barbecue, but so insistent was the demand for explanation that he clambered aboard a truck and told the group how he and his tenants grew tobacco. The field immediately before him, he said, was farmed by the Owens brothers who have a reputation for producing quality leaf. One secret of their success lies in handling the plant bed. One bed prepared last winter contained three acres of land. Before planting, the seed were carefully treated for disease and tested for germination.

He explained the large seedbeds by saying that he liked to go right through with planting once he had started setting. The field is first well prepared and from 1,000 to 1,100 pounds of fertilizer are used. Each tenant usually has only 10 acres of tobacco because the more rapidly the crop is worked or cultivated, the more rapidly it will grow. Dirt is always thrown to the plant until it is on a good ridge which protects the roots from wet feet.

He explained that tobacco cannot stand dampness about the roots. Those hearing him were invited to discover any signs of plant food deficiency or crop disease in the field, and reported none. Dr. Young said he always followed carefully the recommendations of the North Carolina Experiment Station, especially the new facts about fertilizer, ridge cultivation, and seed treatment. This probably made the crop a little more expensive to grow, but the returns had always justified the expense.

This was really the high spot on the trip. At the conclusion of the tour, the group met in a grove on Dr. Young's farm where short talks were made by Dr. W. W. Garner of the United States Department of Agriculture, J. N. Harper, and others. A deliciously prepared barbecue dinner was then served and the group disbanded.

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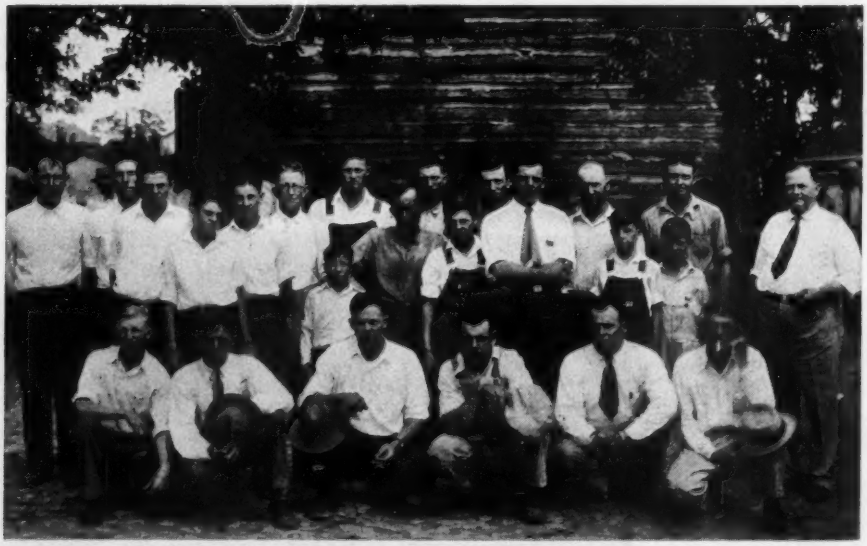

No peasantry here, but sturdy, upstanding, intelligent farmers sharing profits with Dr. C. R. Young, who stands at the extreme right. This group shows tenants on the Young farm.

Mr. French Gilman of the United States Department of Agriculture beside a cluster of Ammobroma which has been exposed by removing the sand from around it. It grows like huge asparagus stalks, tastes delicious, and is good food.

A New Food Plant

By U. V. Wilcox

Washington, D. C.

PLANT scientists of the U. S. Department of Agriculture, always on the alert for new foods to grace the tables of American homes, have discovered a new food plant growing in quantity in the desert hills of southeastern California, Mexico, and elsewhere, where the rainfall is as little as two to six inches a year.

Strangely enough, only a few specimens of this odd plant, known as Ammobroma, or "sand-root," had been seen by white men before 1928, when Frank T. Thackery and M. French Gilman found it growing on an area of about 200 square miles on the east side of the Colorado desert. It was also found growing in a large area in Sonora, Mexico, and may perhaps be found in other dry, sandy regions.

It has been learned that from time immemorial the Pagago Indians, a tribe living in the southwestern regions, had been digging it and eating it either fresh or dried.

Ammobroma, or "sand-root," flowers, but has only rudimentary leaves. It saps most of its food from the roots of a small desert shrub and grows 10 to 20 times as large as its host but does not stunt the host. Apparently it cooperates with its benefactor by providing water in exchange for pre-digested nourishment.

The ammobroma is able to endure the hot suns by growing three to five feet into the soil, with only the flowers appearing above the surface of the ground. The long stems, resembling enormous stalks of asparagus, are both appetizing and nourishing, according to Carl Lumholtz who studied this plant in northern Mexico. It has the further value of being able to produce an annual crop with a rainfall of only four or five inches, which is a record for food plants even in American deserts.

It is believed by these specialists of plant life that the strange plant can be introduced into dry sandhill regions of this and other countries and can be cultivated for a regular harvesting. At

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The Inquiring Mind *and the* Seeing Eye

By Dr. A. S. Alexander

University of Wisconsin

JOHN F. APPLEBY

FEW boys rack their brains and strain their eyes trying to solve knotty problems in mechanics; but John Francis Appleby was an exception. He was an inventive genius—a boy born with a vision and a mission which, in time, he realized and fulfilled.

When but 15 years old he got the idea that the back-bending toil of bundle binding in the hot harvest fields might be done away with if some practical device could be perfected to automatically tie the sheaves with wire or twine instead of bands of straw. Then as he sat on the old rail fence and thought the thing over, I fancy he hummed a jingle such as this, in time with the bumblebees, as he whittled away at a bit of apple-tree wood:

In this wheat bye and bye
Strong twine bands I shall tie
Chewing crickets to defy,
And men's backs keep straight and spry
Or my name's not Appleby.

And so he did, for on the Houghton farm near Whitewater, Wisconsin, in 1858, he made a bird-bill knotter from that bit of apple-tree wood, and it worked. The next year he made a similar one of steel in the little gun shop of Harvey Pierce at Palmyra, Wisconsin. He was but 18 years old at that time and 20 years were to pass before his invention—which he did not patent—came into practical use.

John F. Appleby was born in New York State in 1840, and when five years old was brought by his father to Wisconsin. Taking part, at an early age, in all procedures of the farm he also watched with interest the making of grain headers and other farm implements in the small machine shop of George Esterly, who afterwards manufactured self-binders.

Prompted by Experience

An informative article by F. B. Swingle, in the Wisconsin Agriculturist of July 14, 1923, tells us that young Appleby disliked the slow pace and back-breaking process of binding sheaves by hand and dreamed of a practical binding machine day and night until, in 1858, he made the steel knotter which, probably, was the first to tie a knot in cord. This old knotter may be seen today in the museum of the State Historical Library at Madison.

When the Civil War broke out, Appleby had no opportunity to attempt manufacture of a binder, but he carefully preserved the original knotter.

After serving throughout the war he associated himself with Charles H. Parker and Gustavus Stone and in 1874, at their little shop in Beloit, Wisconsin, turned out an excellent wire binder which was largely his device. It was tried out in a field owned by John Dates, on the old stage route to Madison, and did satisfactory work. Dates liked the work of the new binder, but dismayed its makers by asserting that the wire bands in the straw would be likely to kill the livestock. That objection proved true, for wires swallowed by cattle, transfixing the wall of the stomach, the diaphragm, and sac of the heart cause that form of heart disease which technically is called *traumatic pericarditis* and usually proves fatal.

After the firm had made some wire binders, many users complained that their cattle were killed by wires swallowed with the straw. Bits of binding wire also caused explosions in flour mills by friction in the machinery. Appleby and his partners, therefore, decided that a twine binder would have to be substituted and at once tackled this new problem.

In two months Appleby had the working parts in order. The knotter employed was of the same bird-bill type as the one he made when a boy in Harry Pierce's gun shop.

That was wonderful progress in the desired direction, but, as Appleby said to Mr. Swingle: "The task remained of mounting the binder in such a manner as to take the cut grain and use the power applied from the wheels of the harvester. This took more thinking and planning than the making of the knotter itself. I hit upon the U-frame, planned elevators to carry the grain to the binder, packers

Steel fingers like these knot the bands around millons of sheaves every hour of the harvest season.

to keep the bundle in shape, and a butter to form the square base of the bundle. The needle was so shaped as to compress the bundle before tying. The tripping device gauged the size of the sheaf, and all parts received power from one gear wheel. This took a tremendous deal of planning, but after I had seen the needs of the entire scheme, I set myself to carrying them out, and little real change has been made to this day, except in the way of small improvements."

For months Appleby plodded away alone at his invention, in a garret above the shop, and his associates feared he was accomplishing little; but that was a wrong impression. Progress was steady and at last the new machine was completed. It was tried out in Parker and Stone's rye field near Beloit and, as eye witnesses declared, "worked perfectly and cunningly, not missing a bundle."

Success Assured

Next year the little Beloit shop turned out 115 twine binders and sold them for use in Idaho, Illinois, Iowa, Kansas, Minnesota, Texas, and Wisconsin and the threshermen who threshed the grain first cut were loud in their praises of the manner in which the machines had done their work.

The new twine binders created a furor of excitement wherever they were used and their fame quickly spread throughout the land. Naturally, therefore, the makers of wire binders sent scouts into the fields to watch the wonder-working twine binder in action, with the result that wire binders soon went out of fashion.

In his interview with Mr. Swingle, Appleby stated that the splendid records of their early twine binders proved their durability and, although partisans of the wire binder declared that the crickets would eat off the twine bands, that did not prove true. The makers triumphed, and in four years binder manufacturers turned to the pioneer Wisconsin firm for the rights to build twine binders. That was the natural result of the dictum by farmers that they were through using wire bands and must have those of twine.

Gammon and Deering of Chicago became most interested and in 1879 began manufacturing twine binders under a license granted them by Appleby and his partners. At first there was difficulty in obtaining material of the best quality for the making of the necessary small, smooth, strong type of binding twine, but when William Deering put his million dollars into the manufacture of twine binders and gave his personal attention to the problem, it was solved and suitable twine produced.

In a publication by the International Harvester Company we find it stated that "the idea of flashing a cord around the bundle of grain, tying a knot, cutting the cord, and flinging off the sheaf, stand practically as it was nurtured under Deering's direction." It was also on the recommendation of William Deering, as stated by Appleby, that their first shop-right for the manufacture of twine binders was granted to Hoover, Allen, and Gamble of the Excelsior Harvester Works, at Miamisburg, Montgomery county, Ohio.

In his historic interview Mr. Appleby further stated that his firm built a twine binder each for several other firms and sold licenses to manufacture under a royalty of six dollars on each machine.

In 1882, the McCormicks of Chicago paid Appleby and his partners $35,000 for the right to manufacture twine binders. "Finally," said Mr. Appleby, "we sold out our entire plant to one of the larger firms and laid the foundation of what later grew to be the International Harvester Company." Then Appleby worked for the Deering for many years, but when the larger firms consolidated, he concluded that his life's work was done and therefore retired from active work in

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Fertilizer made the difference. Left—lime only; right—lime, phosphate, and potash. (Douglass Field, Kalamazoo county, Michigan)

The Critical Point

By George M. Grantham

Research Associate in Soils, Michigan State College

THE legume in the ordinary crop rotation gives the farmer more concern than any other crop. So true is this that we may call the year when the legume is supposed to appear the "Critical" point in the rotation. In fact I have come to believe that I can rather accurately judge a sandy soil farmer's chances for success when I know his ability to grow legumes.

The chief reason for this is, I believe, that the sandy soil farmer has access to the same large stores of atmospheric nitrogen as has any farmer anywhere so if he grows the legumes, their mutual friends, the bacteria in the nodules on their roots, are working night and day for him building up a cashable product.

And so a long and complicated organic process, to which science thus far has only discovered the grandstand plays and sidelights, is briefly sketched. The legume crop invites the nodule bacteria to take the free nitrogen from the air and revamp it into food suitable for legumes, and in turn, the legume takes this and reworks it into the much needed proteins of the livestock farmer. Not content with this important work, the legumes are the most active group of plants in adding organic matter to the soil; and organic matter is very important for sandy soils.

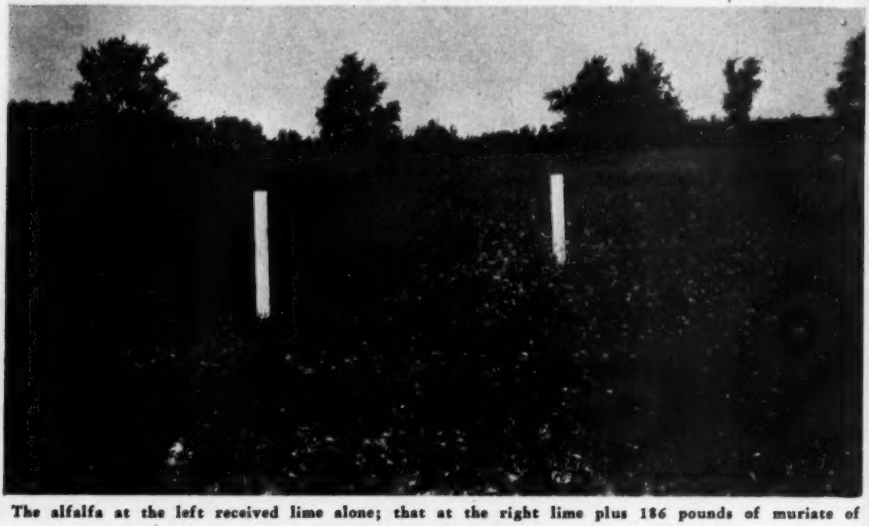
Michigan contains within her borders some 10 or 12 million acres of sandy soils out of a total of 37 million acres in the entire State. I would go a step further though and say that the sandy soil area of the Wolverine State is one of its most important crop-producing areas. On these sandy soils, the famous Michigan

peach crop is fabricated, and the great Glad Hand vineyard is growing, not to mention the vast areas devoted to general farming.

Realizing the economic importance of this sandy soil area, the Soils Department started a group of experimental fields here and there over the State 13 years ago. In addition to these experimental fields located up and down the west side of the State, many fields have been given various fertilizer treatments from year to year. It has been my good fortune to have been connected with this research work on sandy soil since the beginning. In that length of time, the legumes—alfalfa, sweet clover, and red clover—have been given that particular attention which befits their prominence in the crops program of the man who is farming sandy soil.

It would not do to omit saying that for the production of these legumes on sandy soil, it is generally necessary to put on lime in some form. True, there are restricted areas where it is necessary to put on from four to six tons of lime materials, but on the general run of sandy soils, it takes from two to two and one-half tons to correct enough acidity to successfully and profitably grow the legumes.

The point I stress is that the sandy soil farmer should make a test for soil acidity, then act upon it. Soiltex, which my colleague, Professor C. H. Spurway perfected, gives an acidity test that is a reliable guide.



The alfalfa at the left received lime alone; that at the right lime plus 186 pounds of muriate of potash per acre. (Isabella sandy loam—Mecosta county, Michigan)

One of the first jolts we got in our sandy soil experimental work was the relative importance of lime for the legumes. Lime had long been heralded as the one and only stepping-stone necessary to alfalfa on sandy soils. Naturally, in our layout of soil treatments we had applied lime alone, then lime with other plant food, but when the hay weights began to accumulate, it was apparent that the right combination of fertilizers was almost as essential as lime.

For instance, with eight cuttings of alfalfa grown on a Fox sandy loam in Cass county, the average for lime alone was 1,308 pounds of dry hay, but where we used phosphate and potash with the lime, the average cutting made almost a 50 per cent jump, or 1,948 pounds of hay per cutting. Two and three cuttings per year were taken which means that even this sandy soil will produce from two to three tons of barn-dry alfalfa hay if it has the

right treatment from the start.

The effect of nitrogen, phosphoric acid, and potash used singly and in combination on many sandy farms over Michigan brought out very interesting facts. There was considerable speculation as to what nitrogen would do for the legumes because the sandy soils are generally lacking in this element. Nitrogen alone would almost invariably produce a nice stand of dark green plants in the spring, but as the harvest came on, the yield was disappointingly low. The average of 13 cuttings on a low-fertility Fox sandy loam in Kalamazoo county was not enough greater than that of the checks to pay the cost of the material. And we noticed one other thing as well that will interest alfalfa growers. We observed that wherever we put on these nitrogen carriers, bluegrass was the quick sequel. This is objectionable anywhere, but even more so in alfalfa on sandy soils. Bluegrass came snapping at the heels of all the nitrogen-carriers, with manure the worst offender in this respect. This has caused us to look askance at top-dressing alfalfa with manure.

It fell within our study to observe and weigh the results which phosphate alone brought to the mighty legumes. In some cases, it gave an increase; in others, it gave nothing; and in some others, it even decreased the yield mainly through decreasing the stand.

The ideal combination for alfalfa seems to be lime, phosphate, and potash. The following figures are the pounds of dry hay per cutting taken from a Fox sandy loam in Kalamazoo county and the average is for 15 cuttings. Lime alone shows 1,533 pounds; phosphate added to the lime brings the figure up to 1,849 pounds; but where phosphate and potash were added to the lime, the average is 2,125 pounds.

In this alfalfa seeding one drill width was left without fertilizer. The strip was easily found when the young plants began to cover the ground. (Fox sandy loam—St. Joseph county, Michigan)

As a result of these many experiments on our various soil types, we have come to recommend for the legumes a generous application of phosphate and potash, say 250 to 300 pounds of an 0-20-20, this to be put on before the alfalfa is sowed. The ideal way to apply this mixture is to use a grain drill and set it to dribble the phosphate and potash just as deep in the soil as the drill will penetrate.

There are, to be sure, many sandy soil farmers who have a fair start of alfalfa and they seriously inquire if there is any way to prolong its use-

fulness. To this, our answer, is "*yes*" although our results show that top-dressing an old stand does not produce the wealth of hay that fertilizing a new stand does. If it is advisable to top-dress, the same ratio of phosphorus and potash is advised in about the same rate applied right after the first crop has been taken off. A disc drill used before the soil has dried out does a creditable job of getting the phosphate-potash mixture into the soil.

Here are a few generalizations from our results with potash on the legumes on Michigan sandy soils. A sweet clover crop grown for green manure on a light soil in northern Michigan yielded one-third more where potash was used as compared to an area receiving no potash. The following year, the area which received the 100 pounds of potash yielded 62 per cent more potatoes than the other.

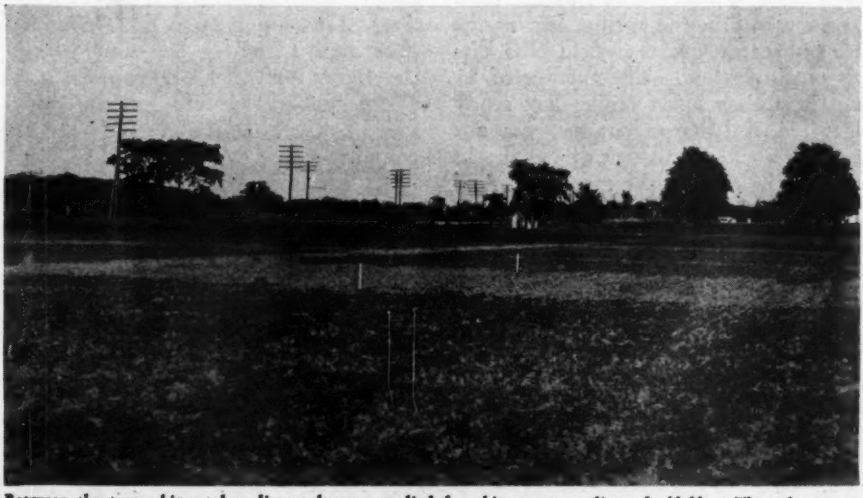
Small grains do not show such marked increase where potash is used as do the legumes. However, when once a leguminous green manure has been turned down, the yields of small grain are about proportional to the amounts of green manure plowed down. This says—apply the potash for the legumes in your rotation.

Potash seems to have quite lasting qualities in the soil. It is rather common to see marked results on legumes three and four years after an application of potash. On a Cass county field in 1921, a plot receiving potash four years previous yielded 3,160 pounds more of green sweet clover than an adjacent plot receiving no potash.

The heaving of sweet clover, alfalfa, and red clover is a serious problem in our latitude. Where potash has been applied, the heaving takes place just the same as it does on any soil, but the plants on potash-treated soil seem to have more resistance and survive the hardships better than plants on soils receiving no potash.

On a sandy loam soil in southern Michigan growing sweet clover in the spring of 1928, where no potash had been applied, 57 per cent of the original stand was killed by heaving; where potash had been applied, only 8 per cent of the plants failed to survive.

It should be understood that the results set out are for the legumes only, but because these constitute the "critical" point in the cropping program of the sandy soil farmer, fertilizing them merits very serious consideration.



Between the two white stakes, lime only was applied for this young seeding of alfalfa. The other area received lime, phosphate, and potash. Other check areas can be noticed in the field. (Fox sandy loam, Kalamazoo county, Michigan)

The Unseen Half

By E. N. Bressman

Associate Professor of Farm Crops, Oregon Agricultural College

THE root is one of the most important parts of the crop plant and in many cases it makes up more than half of the total bulk of the plant, still there has been less attention directed to the root of the plant than to any other part. This is true because the root is invisible and "things out of sight are out of mind."

This is the root of "Man-in-the-ground," also called wild cucumber —a common weed.

Another important reason for apparent lack of attention to the root system of a crop plant is that it is no easy task to find out things about the root system. There has, however, in the last few years been some work done on roots, both native and cultivated plants. Most of this work has centered around the activities of Dr. J. E. Weaver at the University of Nebraska. Dr. Weaver and his associates have been working steadily on crop plant roots and have revealed some astonishing things about this part of the plant.

The roots of a plant take on different sizes, shapes, and characteristics under various soil conditions. It is, therefore, important to know something in regard to soils when studying roots. On the other hand, it is important to know something about the roots of plants in a study of soil conditions. Most of the good work on roots has been done under natural soil conditions and not in the laboratory or alongside of a bank where roots are growing rather artificially. Many roots have been traced 15 to 20 feet in depth and innumerable ones such as our common crops, like wheat, have been found to grow nicely at a depth of 6 feet. Many soil conditions such as alkali, acidity, drainage, and fertility, have a marked effect on root systems and so must be taken into consideration in such a study.

The wheat plant, similar to all other grasses, has two root systems. The first one to come out is known as the seminal or seed root system. This root system develops from the seed. The second root system which develops is known as the adventitious or secondary, or called by some folks the permanent root system. This latter term is not desirable because quite often the seminal root system is the only one which develops. Many times under the wheat-growing conditions of eastern Oregon only the seminal or first root system develops. This is due, more than likely, to unusual moisture conditions during the fall and winter season.

Ordinarily the working level of the root system of wheat is somewhere

around 3 or 4 feet in depth, but quite often under favorable conditions the root system reaches a depth of 8 or 9 feet. This depth can be varied greatly by soil conditions and particularly by fertilizers and moisture. Under heavy clay soil conditions roots do not penetrate deeply but are rather superficial and the plants are subject to injury from lack of moisture. Rye has a root system very similar to that of wheat, the only difference being, maybe, that the roots of the rye plant are branched to a greater extent.

In general oats and barley do not have as extensive a root system as wheat, particularly fall sown wheat. However, the extent of the root system depends greatly upon the variety. It is not uncommon for oats and barley to have root systems which reach to a depth of 6 feet.

Depth of Planting Is Important

The relation of the type of root growth to cultural practices is of interest. Anyone who has dug roots will quickly find out that the upper layers of the surface soil are completely filled with the roots of cereal crops; therefore, one can readily see there is no room for weeds or other plants in a field. In addition, this extensive root system emphasizes the necessity of proper rate of planting, particularly under dry conditions where moisture is limited. The necessity of producing an extensive root system in fall grains before cold conditions stop the growth of the plant is apparent. There is no doubt that wheats with well developed, extensive root systems are not so apt to winterkill. Therefore, well-prepared seedbeds with grain sowed at a proper depth and a proper rate are of great importance to the development and type of root system. The time is not far off when plants will be selected because of their particular type of root system which may be adapted to certain conditions. Possibly many of the varieties which are adapted to certain growing conditions owe their adaptation to their particular type of root system.

The root system of corn is of great interest because of its distinctive lateral spread. It is the usual thing for the corn root to spread from 3 to 4 feet in all directions from the plant. It is apparent, therefore, that the corn plant uses all of the available moisture and fertility in the ordinary field even though the plants are spaced at a considerable distance. Without a doubt too many growers are afraid of not using all their available fertility and moisture and plant corn too thickly. It is not unusual for the corn plant to send its roots down to a depth of 6 or 7 feet in the soil.

In all of the cereals, which include corn, wheat, and barley, the root systems are not affected greatly by depth of planting except in the case where no secondary root system is formed In the latter case the depth of planting is of importance because the seminal or primary root system comes out where the seed is located in the soil. Ordinarily seeds of these crops should be planted no deeper than to get them into moisture. The permanent root systems come out about an inch below the surface of the soil under ordinary moisture conditions. Of course if the ground is extremely dry, this depth may vary considerably.

Roots of Grasses Grow Deep

The many different grasses such as bluegrass, orchard grass, bent grass, the fescues, and others, have extremely interesting root systems. Although the root systems are fibrous and fill the surface soil, making a heavy sod, the root systems of these grasses penetrate quite deeply into the soil. Although the grass above ground may dry during the summer time, the roots from the extreme depth are able to carry considerable moisture, and at the first rains in the

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The total acreage of wheat on Mr. Baird's Edgewood Farm in 1930 was 500 acres. This field threshed out approximately 40 bushels of wheat per acre.

From Peaches to Wheat

By Henry T. Maddux

Atlanta, Georgia

THE Hale Georgia Farms Company at Fort Valley, Georgia, used to have the largest peach orchard in the world. For several years prior to 1930 practically all Georgia peach growers lost money and, therefore, Mr. John H. Baird, president and general manager of the company, changed from peaches to other crops, one of which was wheat. He planted a small acreage of wheat in 1927 and this was gradually increased from year to year. In 1930 he grew 500 acres which averaged 32 bushels per acre and practically all of which was of No. 1 grade.

The average yield of wheat in Georgia is about 9 to 10 bushels per acre, and most of this is of No. 2 grade. How Mr. Baird produced 32 bushels of wheat per acre rather than 10 bushels per acre is an interesting story.

Mr. Baird came to Georgia from New Jersey, but he has lived at Fort Valley so long that he is now considered a "Georgia cracker." He is a keen student of farming and in his beautiful home at Edgewood Farm he maintains an office just like that of the average business man. He has a very complete agricultural library.

In the preparation and planting of his 1930 wheat crop Mr. Baird used tractors, and the crop was harvested with a combine. The fact is that Fort Valley and Peach county have changed a considerable acreage from peaches to wheat in recent years and there are now a number of combines in opera-

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Taking the Backache out of LAWN CARE

By

O. C. Lee

Agricultural Extension Department of Purdue University

A beautiful green lawn is a setting for all plantings.

WHAT is a greater asset to a home and its surroundings than a beautiful green lawn? How many times we have admired certain homes, not because of the neat house or the shade trees, but because of the beautiful setting which can be attributed to a well-kept lawn. Perhaps the caretaker has spent many long days cutting and digging out weeds and replanting these areas to grass. It may be also that he is up-to-date, using the new method of preventing the growth of weeds by encouraging a heavy turf.

The old theory was that weeds cause poor lawns, while the newer idea is that poor lawns cause weeds. Weeds come in merely because they find an ideal place to grow when the turf is thin. A lawn properly cared for has a thick, heavy turf and leaves no room for the intruder. To get a weed-proof turf, it is necessary to have sufficient humus and plant food at the surface of the soil, to use pure seed, and to continue to fertilize the lawn. Grasses like any other crop must have plant food to live and grow.

Hand weeding rarely destroys the pesky weeds since most of them, particularly dandelions and plantain, have the habit of sprouting after cutting. You might come back to the old argument that plants cannot live without leaf growth. That is perfectly true, but foliage develops rapidly and keeping all leaf growth from forming is a long and tedious process that is impractical on the average lawn. And even if the roots are starved out, new weed seeds are constantly being introduced into the turf either during the reseeding process or when the wind blows dandelions, dock, and other pests from nearby lawns and waste places.

In other words, the best way to maintain a weed-free lawn is to develop a condition not favorable to weed growth. A thick, heavy turf

will leave no room for the weedy intruder.

The best way to encourage the grass is to use fertilizer. Extensive tests have shown that equal amounts of a complete fertilizer and ammonium sulphate are the best to use. There are two reasons for this:—first, ammonium sulphate is rich in nitrogen and it is nitrogen that produces leaf growth; second, it produces an acid reaction that is detrimental to practically all weeds and not harmful to common turf grasses. In addition the complete fertilizer supplies the elements phosphorus and potassium as well as additional nitrogen, all of which are essential for plant growth.

Ammonium sulphate must be used with caution, however, or it will burn the grass. Burning can be prevented if this material is not applied at a greater rate than five pounds per 1,000 square feet or 10 pounds of the mixture per 1,000 square feet. Thorough watering to wash the material off the grass is essential. Furthermore, sulphate of ammonia can safely be applied during spring and early summer, also during the cool fall months, but it ought not to be used in the heat of the summer season or disaster may follow.

There are some lawns that fertilizer will never make perfect. The fault here is in attempting to grow grass on the infertile, clayey subsoil cast up when the house foundations were excavated. Mixed with this subsoil are masses of waste building material. About the only thing that can be done to produce a good turf on such an area is to add a layer of good topsoil and start all over again. This layer of soil need not be more than three or four inches deep, as grasses do not root deeply.

Anyone contemplating the erection of a new home should profit by the experience of others and specify that the rich topsoil be saved and used later for surface dressing of the lawn. This is an important step as it will save the work of later transporting soil, perhaps from a distant field.

Another common error in lawn maintenance is the use of lime. It encourages weed growth and has no place on the average home lawn. City water usually contains lime, sufficient to supply the grass with this element. Turf grasses, on the other hand, are quite tolerant to acidity, particularly when abundant plant food is available.

It may seem rather difficult to account for the army of weeds that infest the lawn. It is true that weed seeds blow in from nearby lots or roadsides. More often, however, weeds are introduced as impurities in lawn seeds, and once started they readily reseed and persist. Use good, clean seed to do away with endless trouble. Experience has shown that for most lawns bluegrass is the best all-around grass. It is true that bent grasses make beautiful lawns, but the seed is expensive and the grass grows so rapidly that it is an endless job to keep it properly mowed.

Common and buckhorn plantains are two of our worst lawn pests.

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Due to Details

By A. E. Wilkinson

Vegetable Gardening Specialist, Connecticut Agricultural College, Storrs, Connecticut

A POTATO yield of 1,119 bushels of 61 pounds from 2½ acres is "some yield." This is not an estimated yield, nor is it figured by digging a row here or there in the patch. It is the total yield harvested by Mr. Horace Pease of Somers, Connecticut, during the dry year of 1929. In fact, it is what he sold from his crop after it had been stored, and includes any shrinkage that might have taken place in storage as well. The total yield might have been larger if there had not been any shrinkage. The average yield per acre was 447.6 bushels. This includes hard lands, ends of rows, poor rows, skips, and everything else in the crop, as the records have been taken from one field devoted to this crop.

Considered All Factors

There are some interesting facts that can be obtained from the methods used and other items in growing this crop. The soil on which the crop grew is known as a triassic stony loam. This loam is a reddish to red-brown silty type with a depth of 12 to 14 inches. The subsoil is a medium heavy sandy loam of reddish color. The material ranges from a sandy loam to a heavy silty loam—the latter has a much darker red color. Both topsoil and subsoil contain a number of angular boulders of all sizes and with some small stones. The greater portion of these consist of the red and brown sandstones of the Triassic period. The surface of this type is hilly or rolling; the outline of the hills is usually gently rounded. The prevailing red color is due to the presence of compounds of iron.

The soil was spring plowed—part of it being a turf and the balance used for tobacco growing in 1928. The soil was harrowed with a tractor harrow and thoroughly fined and smoothed. It was not marked out for planting.

The variety used was Green Mountains. One-half of the seed was certified and obtained from Prince Edward Island; the other half certified and obtained from a good source in Maine. This seed was stored in the northern locality during the winter and was shipped to Somers in the spring.

The seed was cut with a machine as needed for planting. Care was exercised to have at least one good eye on each piece but the number of eyes on each piece was variable. Planting took place between May 25 and May 31. Seeds were planted with a two-man planter, one man driving the horses and the other seeing that the seed pieces dropped at regular intervals and also that the machine marked out the next row.

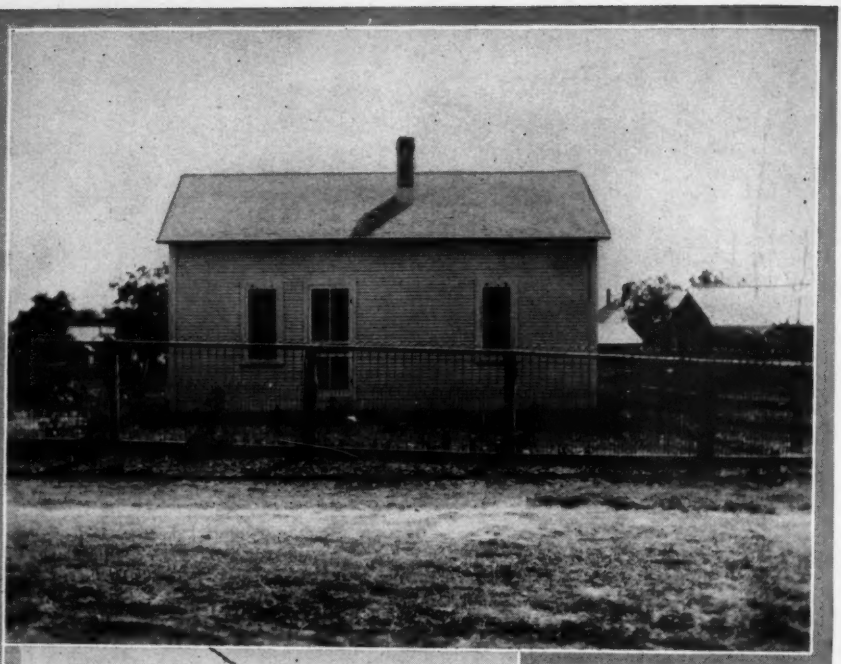
The rows were three feet apart and the seed pieces 12 to 13 inches apart. The seed was put in deep, about six inches, because the machine was set to throw a furrow or ridge over the seed piece. The real depth was only two inches.

A 5-8-5 fertilizer was used at the rate of 3,000 pounds per acre. One-half of this fertilizer was broadcast

(*Turn to page 55*)

The price of gas may or may not be the subject of conversation here. At any rate, the big fellow seems happy in giving service to the fair lady.

PICTORIAL



Above: In the little German town of Fredericksburg, Texas, are to be found a class of houses unknown elsewhere. They are called "Sunday houses," and solve for many ranchmen and farmers the problem of week-end trips to town for shopping, trading, and attending church. The houses are furnished, but few of the nearly 100 of them in the town contain kitchen utensils. The owners bring enough food to last them from Saturday to Monday, thus freeing the women from cooking and saving the expense of stocking two kitchens.

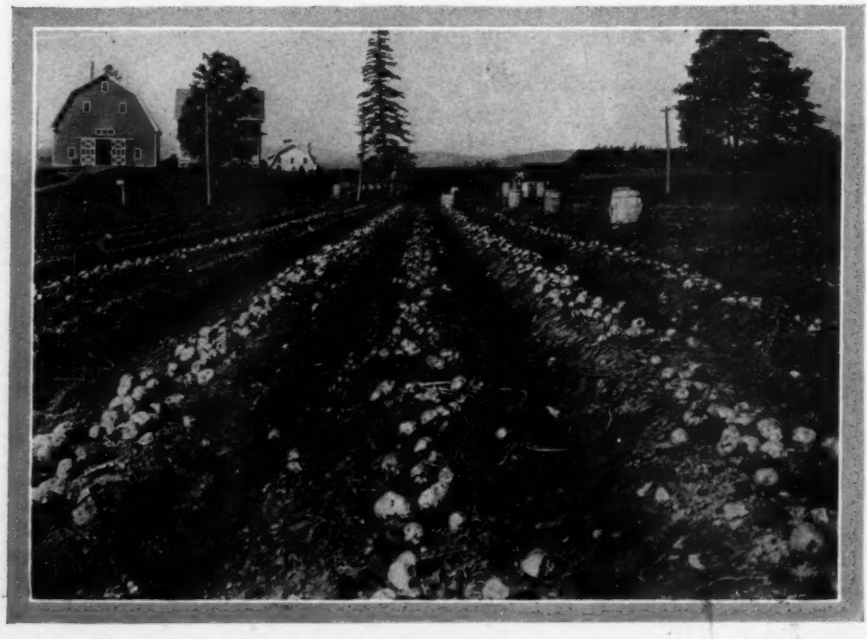
Left: This mail-box, located in San Miguel county, Colorado, was made out of the back of an old Ford roadster. It is located in an unoccupied territory, where the only thing raised on the land is a little grass for sheep. The people using this box have to travel many miles to get their mail.

Right: Homer Lapp won first place in the annual wheatland plowing contest, recently held in Illinois. He drove a three-horse team instead of a tractor, proving that the old-fashioned method is still good. This is the third time that he has won the contest, and he is shown here with the trophy.

Below: Having outlived its usefulness as a refuge from hostile Indians, this old blockhouse in Minnesota has been converted into a silo.

Above: When Uncle Sam finds that his bees are suffering with stomach-aches or sprained ankles, he doesn't treat the ailments as he would if the sufferers were human beings. Instead of examining the patient, he examines the honey that the bees have been making and then prescribes accordingly. Two workers in the bee culture laboratory of the U. S. Department of Agriculture are shown here making diagnoses from the hundreds of samples placed before them.

Below: A typical scene at this time of the year in Aroostook county, Maine. Consistently large yields and good quality of potatoes are obtained as a result of applying the right kind and quantity of fertilizer.



Above: The young lady, second from the left, is Miss Lucille Gates of Pomona, California, who won the American Farm Girl Championship at the recent Los Angeles county fair. She excelled at milking, churning, corn-husking, raking, and tractor driving. The young pigs shown in the picture were disinclined to appear before the judges until the fair farmerettes made their appearance and bribed them with milk in baby bottles

Below: This quaint cottage with the forbiding looking cannon is the birthplace of General Ulysses S. Grant located on the Ohio River a few miles southwest of Cincinnati, Ohio.

Above: In Porto Rico, a soft drink is served from cocoanuts fresh from the palm. The gentlemen in the picture, left to right, are: Mr. Kerr, San Juan Ginneries; Mr. Leonard, Porto Rico Experiment Station; Mr. Jimenez; Dr. Forbes, Cornell University; and Mr. Rorke, San Juan Ginneries.

Left: Mrs. Leland Booth, wife of Leland Booth, Editor of The West Virginia Farm News, was one of an interested audience when Charles Gapen, Chief of the U. S. Department of Agriculture's Press Service, explained how the department keeps the nation posted with regard to its activities, at the recent convention of agricultural college editors.

The Editors Talk

Paul Wagner 1843-1930

Professor Dr. Paul Wagner passed away on August 25th. His was a long, active, and fruitful life. We are indeed fortunate to be able to present to our readers, in another section of this issue, an appreciation of Paul Wagner and his work written by Professor Dr. O. Eckstein of Berlin.

While Paul Wagner lived and worked in Germany, the exact methods introduced by him into agricultural research work have had a marked and stimulating effect on research work in this country. In fact, as Professor Eckstein points out, the researches of Paul Wagner with other workers are the foundation upon which our present fertilizer theory has been built.

Following Professor Eckstein's article are some extracts from "Die Ernaehrung de Pflanze" of March 15, 1923, which give further incidents in the life of Professor Wagner. They were published at the conclusion of fifty years of activity at the agricultural experiment station of Darmstadt and just previous to the celebration of his eightieth birthday.

In these days of depression and possible confusion, we may well learn with profit what Paul Wagner said in an address when he was eighty-five years old:

"I praise the spirit of our time."

Second International Soil Congress

The Second International Congress of Soil Science was held this year in Russia. The Congress was opened on July 20 in the Academy of Science, Leningrad.

Several workers from the American experiment stations attended this Congress, among them Professor A. B. Beaumont of the Agricultural College, Amherst, Massachusetts. We are now very pleased indeed to publish in another part of this issue an account of the Congress and a report of Professor Beaumont's impressions of experimental work and agriculture in Russia. Everybody will be pleased to note that while the United States could have no official representatives, America was still represented by the largest number of delegates from any foreign country. Further than that, they were welcomed as cordially and treated with as much consideration as any other group of visitors to Russia.

There is much difference of opinion regarding Russia, of course. Opinions undoubtedly depend upon our viewpoints and on how much or how little we know. Such differences make it all the more interesting and desirable to know as many viewpoints as possible, especially when they come from scientific workers trained in making impartial observations wherever possible.

At the opening of the Congress it was the international note rather than the national note that was sounded at the very beginning. Professor N. I.

Vavilov in extending the welcome to the delegates said: "Science is international." Sir John Russell, Director of Rothamsted Agricultural Experiment Station in England, and the newly elected president of the International Society of Soil Science, also said in response: "Science knows no boundaries, either by nation or by class. A man is judged by what he is worth and what he has done." With these sentiments everybody will heartily agree.

But whether everybody will agree with Professor Vavilov when he says that, "big state farms and collective farms are the only real solution of the agricultural problem" is quite another question. Undoubtedly, there will be many "ayes" and many "nays" and some who entertain grave doubts of this cure. Even assuming that the economists are right when they tell us that the larger the unit, within reason, the cheaper the cost of production and the greater the profit, there are still other considerations. An agricultural policy founded on this concept, immediately presumes the setting up of relatively large organizations which will be capable of going ahead in good time, but apparently rather difficult to back up in times of depression without throwing large numbers entirely out of work. Urban industry seems to be learning this right now. Is it well to go ahead too rapidly on the same principle in agriculture?

Agriculture after all, in addition to being an economic proposition, is a way of life that produces a virile, strong, and individualistic humanity. Are we yet certain that the third generation of highly specialized workers in mass production units will in any measure be equal to people that at present come from the farms? Undoubtedly, this is a question for which many able minds will find plenty of material to study for years to come.

The writer was very much impressed with the high quality of agricultural science, particularly in the genesis and morphology of soils. Of great interest to workers in the field of fertilizers will be the account of the Institute of Fertilizers in Moscow. The Institute houses during the winter months a staff of eight hundred. A new institute with a capacity for six times that of the present one is being built. The Institute for Fertilizers embraces different subdivisions. Apparently it is the purpose to control the production and distribution of fertilizers in forms and amounts where they are needed. For instance, only di-calcium phosphate will be distributed in certain soil zones. This is certainly a very idealistic plan. The institute also carries on work in research regarding fertilizer materials and sources. The last part of the article gives an interesting account in a broad way of future plans for experimental and practical agriculture in the U. S. S. R. They are on a large and impressive scale.

Certainly the solutions of scientific and practical agricultural problems as they are being planned in Russia will be watched with keen interest.

Practical Optimism

It is very refreshing to find a national publication that is not afraid to face the facts, even though they may be very unpleasant. The paper is "The Annalist" of Friday, September 26. It says:

> "With various indices failing in turn to indicate the exact turn in the present depression, most business forecasters who really try to make unbiased forecasts and are not trying to add to the excess supply of manufactured optimism have fallen back on the old reliable forecast that the business curve is bound to turn upward in the course of time, but that it is idle to attempt to pick the exact month."

In another place in the same article, the author points out regarding manufactured optimism:

> "Reports of a beginning of forward buying and other indications of the beginning of a fresh deluge of manufactured optimism have featured the non-statistical news items of the last week or so, but these indications have been repudiated with astonishing promptness by the stock market and by a long list of commodity markets. We are still suffering from overproduction of optimism, but the fact that no one any longer takes it seriously is an encouraging sign, although a bad feature of it is that when these reports eventually turn out to be real, as eventually they must, no one will believe them."

Obvious and superficial optimism, merely because it is the right thing to appear optimistic, will undoubtedly get us nowhere, and as "The Annalist" points out, do some harm. Facts are facts and cannot be ignored. Certainly economic facts of fundamental importance cannot be overlooked.

What is needed possibly more than optimism is facing the facts, hard work, and courage.

Guesswork vs. Knowledge

The following submitted by Mr. Ray L. Hahn, Instructor in Vocational Agriculture at the Windham High School, Willimantic, Connecticut, contains so much good food for thought that we are presenting it upon our editorial pages.

In his letter accompanying the article, Mr. Hahn says, "The Federal Farm Board, controlled production, the increased stress on economics of production, and the increased demand for institutional research give me a felt need for calling attention to the individual research in production that every producer can best do for himself. Increased attention to this phase of production is not likely to give a false stimulus to an already troublesome production and it may ultimately afford producers of farm products more genuine relief than all our nation-wide legislative programs."

His article follows:

"Controlled production ought to be synonymous with wise production, but is more apt to be confused with legislative control or control based on guesswork. Experience teaches me that the producer needs knowledge not only of specific practices, but also of specific results.

Agricultural students in particular and farmers in general can not be too careful of the exactitude with which practices and results are measured. Inaccurate or partial accounting are quite likely to show a profit from uneconomic practices. Overhead costs are ignored or are charged too low. In such cases an actually high cost product is offered the market for awhile, following which come the years when the equipment, housing, and other overhead investments require renewal or repairs for which no financial provision has been made. Distress, failures, and unregulated production of this sort could often be lessened by proper accounting.

"I am not thinking solely of the curbing of production in speaking of controlled production. Decisions based on inaccurate measures are quite as likely to overlook opportunities. For illustration, I shall cite three experiences with students of vocational agriculture, a group in which I am particularly concerned as an agricultural instructor.

"One of my students used for his potato project a home lot always rated

as a half acre. On that basis he had a yield of 91 bushels to the acre! The care of the crop had been thorough so a natural conclusion would have been that there was a soil unsuited to the crop. Yet, actual measurement showed the plot contained only one-fifth acre with a corresponding yield of 225 bushels per acre, which was a good beginning.

"In another instance, a student produced, in a poor year, 78 bushels of potatoes on his half acre at a cost of $1.24 per bushel. That year at harvest time the market offered $1.75 to $2. a bushel for good stock. He sold 23 bushels and decided to hold the remaining 55 bushels for a rise in price. Inventorying the crop held at the price offered gave him a return of practically seventy cents an hour for his labor in producing the crop. Note the distinction between producing and marketing as revealed by his accounting.

"His storage and marketing project began with the inventory of $90 and accumulated $9.27 in further costs. He finally sold 35 bushels (rats and shrinkage took the remainder) for $61.25 leaving a loss of approximately $38 on the storage venture. Producing potatoes paid a profit, but faulty judgment in marketing cancelled it. It may be aside from the immediate subject, but it is worth adding that he has profited from that experience in subsequent years.

"The experience of another student showed him that on anything less than a very large scale many significant differences may easily escape notice. The average difference of three to five ouncets per hill of potatoes was imperceptible without a careful measure of the crop. Yet, such a difference constitutes a difference in yield of 40 to 60 bushels per acre!

"Restriction is easier to apply than wise direction in either education or production. Judging from educational experience, the wise direction of activities is a more effective control than an indiscriminate restriction on all activities. Control of production by guesswork is a fundamental weakness that restricted production conceals but does not cure."

Electricity on the Farm

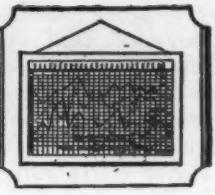
The widening use of electricity, especially in lightening the burden on farms, is the subject of much interest to all of our agriculturists. What is happening along this line in other countries is, therefore, worthy to note.

In Canada, for instance, nearly $1,000,000,000. was invested in central electric power stations at the end of 1928, according to the official report issued by the Canadian Government Bureau of Statistics. This amount was a larger capital expenditure than the railways of Canada reported for 1928.

The number of customers who purchased power from the central electric power stations in 1928 was 1,464,000, or an increase of 82,000 over 1927. Only 1.6 per cent of the electric power produced in central stations is from fuel plants. Water power is one of the principal Canadian natural resources. Compared with other countries, Canada stands second only to the United States in turbine horsepower installation and above the United States in turbine horsepower installation per 1,000 of population. On a per capita basis, Canada has about five times the installation of the United States. There is now scarcely a village in Canada that does not enjoy the advantages of electric power.

Assuming that a household is 4.63 persons, over two-thirds of the homes in Canada, both rural and urban, are using electricity for lighting and other domestic purposes. The Canadian people are fortunate in having this power developed for them from water power, largely on a service basis.

AGRICULTURAL DEVELOPMENTS



TRENCH SILOS

The practicability of constructing trench silos for storage of a reserve supply of succulent feed is being stressed by the Colorado Agricultural College. Trench silos can be built at little expense, according to the college, and will serve two purposes. First they will give farmers a reserve supply of succulent feed that may be held for feeding during the next few years, since silage improves with age. Second, such silos will take care of a large forage surplus this winter that otherwise might have a disastrous effect on forage prices. The College invites anyone interested in trench silos to write for information concerning their construction and use.

FRESH VEGETABLES

In order to insure consumers who patronize roadside markets that they are getting strictly fresh vegtables, 22 farmers operating roadside markets in Bergen county, New Jersey, have organized under a plan of standardization and certification of their markets. This is an important move toward winning consumer confidence and patronage which has suffered through the practice of hucksters setting up roadside markets in which they offer inferior produce brought from city markets. These hucksters posing as bona fide producers have been condemned by the press, yet there has been no means for a consumer to tell the difference between a huckster and a farmer offering his own produce for sale.

W. Raymond Stone, Bergen County Agricultural Agent, worked out a plan of standardizing roadside markets so that the reliable farmer-owned ones could be identified. The cooperation of the Bergen County Chamber of Commerce was secured to the extent of accrediting the stands of farmers who would conform to the rules. Suittable signs by which accredited markets could be readily identified for motorists were prepared. These signs are rented to the farmer for $5, but remain the property of the Chamber of Commerce with the understanding that any violation of the rules governing market standardization is sufficient cause for removal of the sign.

The farmer in order to have his roadside market accrediated must agree to produce at least 50 per cent of all products offered for sale and to display on his stand only well-graded products of high quality. Furthermore, he agrees that products bought for resale must come directly from a nearby farm and be carefully graded before selling.

The new plan was put into operation in 1929 and stand operators report that they have been doing an increasing volume of business because of it.

POTASH PAYS ON GRAPES

GROWERS and others interested in the grape industry were given a good opportunity to study the effects of proper fertilization in the growing of quality grapes at the Eighth Annual Grape Tour of Kent county, Delaware, which took place on August 21. At the home of C. A. Schmid, located four miles north of Dover, the starting point of the tour, the party saw 11 acres in vineyards. Mr. Schmid is one of the most progressive growers of the county and uses for his

grapes 400 pounds per acre of a mixture composed of two-thirds phosphoric acid and one-third muriate of potash. To secure nitrogen, he sows crimson clover between the rows of vines. He applies the fertilizer to the clover before turning the crop under in the early spring.

One of the prettiest vineyards in the State according to other growers is that of John M. Roe, residing one mile east of Dover. This vineyard is about six years old and is a pretty sight with its cement posts, accurately spaced and aligned, clean tillage, and careful training of the vines. Mr. Roe has cut as high as 5,700 baskets (jumbos) from this 10-acre vineyard. When one realizes that each basket holds about 15 pounds of grapes, it can be seen that Mr. Roe knows his business. He uses 600 pounds per acre of a mixture composed of 1,600 pounds pure raw bone and 400 pounds muriate of potash.

Incidentally this combination, 1,600 pounds of bone and 400 pounds of muriate of potash, seems to be the most popular mixture used by growers in this grape area. This may be the result of six years' experimental work where PK gave increased yields and N was not a limiting factor. In fact the NPK plots gave less yields than did the PK plots during all of the six years.—G. R. Cobb, Salisbury, Md.

FUNDS FOR FALL AND WINTER PASTURES

FIVE hundred and fifty thousand dollars of the unexpended balance of the $6,000,000, appropriated by Congress last March for loans through the farmers' seed loan office of the U. S. Department of Agriculture to relieve distress in 15 States from storms, floods, and drought in 1930, have been allotted to farmers seriously affected by the summer's drought in Alabama, Oklahoma, Virginia, and Missouri, for the purchase of seed and fertilizer for fall and winter pastures.

Applications for these loans must be backed by the farmer's promissory note and a mortgage on his crops, and must be approved by a county committee before they can be accepted in Washington, according to G. L. Hoffman, who is in charge of the Federal Seed Loan Office. Loans can not be made for crops to be harvested in 1931, he says.

Approximately 2,000 applications for loans have been received to date, and Mr. Hoffman expects as many more by October 15, the final day for accepting applications. Of these 1,732 have been approved as follows: Alabama, $8,548.00 on 180 loans; Oklahoma, $27,853.45 on 859 loans; Virginia, $24,990.00 on 368 loans; and Missouri, $16,469.25 on 325 loans.

VITAMINS IN SWEET POTATOES

Sweet potatoes are a good source of vitamins, say chemists of the United States Department of Agriculture. This vegetable contains as much vitamin A (the antiophthalmic vitamin) as the leafy vegetables. It contains more vitamin B (the antineuritic vitamin) than many other root crops. As a source of vitamin C sweet potato juice has an antiscorbutic value equal to about one-third that of orange juice and one-half that of peach or pineapple juice.

WHAT IT COSTS TO PRODUCE CROPS

Ottawa, Canada.—Some interesting experiments concerning the cost of producing farm crops have been made by the Canadian Government Central Experimental Farm, Ottawa. For example, it cost $30.62 to produce an acre of oats having a value of $33.08; the cost of producing hay in 1929 was found to be $19.60 an acre for hay valued at $34.06; ensilage corn cost $4.38 an acre more to produce than it

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PAUL WAGNER

1843-1930

By Professor Dr. O. Eckstein

Berlin, Germany

Translated from the German by G. Brate

THE last survivor of the classic period of growth of agricultural science, Paul Wagner, passed away on August 25th after an active and fruitful life. The exact methods introduced by Paul Wagner into agricultural research work added a great deal to the elucidation of fertilizer problems and to their development into a science. The works of Paul Wagner, beginning with his thesis written in 1869 on nitrogen as plant food and followed in quick succession by numerous treatises on fertilizer research and with the researches of Liebig, Lawes, Maercker, and others, are the foundation upon which our present fertilizer theory has been built. One of the monuments giving evidence of his activity is the Agricultural Experiment Station at Darmstadt directed by him from 1872 to 1923, where the majority of his best works originated.

Professor Dr. Paul Wagner

When Paul Wagner in the spring of 1923 celebrated his eightieth birthday, his activity found full estimation in all the leading agricultural publications, but the attainment of the biblical age did not mean the conclusion of the work of this untiring research scientist. It is gratifying to notice in our time of exhaustive nerves that up to his death Paul Wagner contributed to the enrichment of the agricultural literature and especially to the development of the fertilizer theory by valuable works which, after his activity as a research scientist had ended, he drew from his vast knowledge.

The fundamental works of Paul Wagner date almost half a century back, but the very fact that in his

old age he still showed understanding for the spirit of the present time and helped the young research scientists as much as possible is to be very highly appreciated by everybody who knew his work and him personally.

At an address made by Paul Wagner when he was 85 years old on the occasion of the Seventh Potash Day in Berlin in which he expressed enthusiastically the program of his life, he said:

"We are living in the age of experiments. That is to be highly appreciated. I praise the spirit of our time; I would even praise it more enthusiastically, if the readiness to experiment would enhance the willingness to fight. There is a great natural law which is called fight and there is no progress without fight. This law applies to the material and to the spiritual world. To my mind it has become so calm on the battlefields of the past. What a joyful time it used to be when Freiherr von Dael-Koeth, Koenig, Hermann von Liebig, Julius Kuehn, Max Maercker, and many brave farmers and efficient representatives of the fertilizer industry were at war with Paul Wagner. That was a gay fight, a battle of progress fought with knightly weapons. Poisonous bombs were not known, and these cannot be recommended; they did not prove to be of any value! But it is so calm today, so peaceful on the places of the former tournaments. But I welcome the present willingness to work. And, of course, we have not yet 'researched away' everything; there is much left and new things are continuously arising. Nature evades our questions as much as possible, and gives a meaningless reply to unsensible questions. It answers comprehensibly to an intelligent question. Indeed, we have to drive nature into a corner by well-planned, exact, persistent questioning, by clear interrogation, by extensive, critical, devoted research. And I say again: *only the closest cooperation of scientific research work and practical experience* can help us to make progress, to gain higher aims, to increase the wealth of the country and the strength for the rebuilding of the greatness of the German people."

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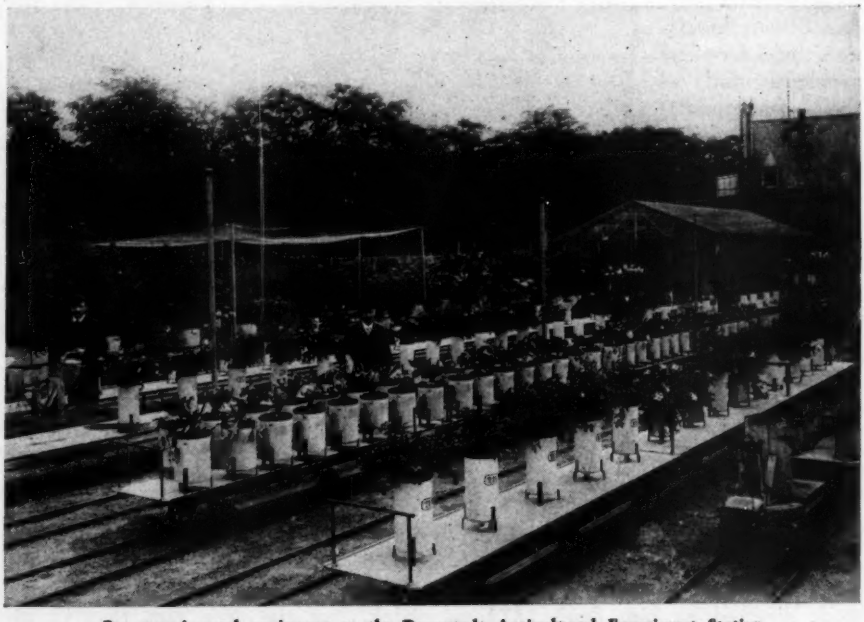

Pot experimental equipment at the Darmstadt Agricultural Experiment Station.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Soils, Fertilizers, Economics, Crops, Crop Diseases, and Insects. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Crop Yields from Illinois Experiment Fields in 1929" show the necessity of adapting the fertilizer treatment to the soil and crop system. Dr. F. C. Bauer reports this work in Illinois Agricultural Experiment Station Bulletin 347. The yields of crops in a number of rotations on many soils, variously fertilized, are given. All this work is summarized on a profit basis allowing average values of crops and cost of fertilizers and their application. These data show that limestone, manure, crop residues, phosphoric acid, and potash all cause profitable increases on most of the soils studied. While the author does not definitely bring it out, the data suggest that the influence of these treatments on legume crops in the rotation is one of the most important factors in determining their profitableness. In other words, the legume is apparently the key crop of the rotation. When a treatment favors legume growth this improvement probably exerts a beneficial effect on the following crops. To this is added the immediate benefits of the treatment of each crop in the rotation. This bulletin will be of greatest value to the farmers and county agents of Illinois, but other States in the corn belt will find pertinent material therein.

The results of several years experimental work on cotton growing on soils typical of the several regions of Arkansas have been compiled by Professor Martin Nelson in Arkansas Agricultural Experiment Station Bul. 255, "Cooperative Fertilizer Experiments with Cotton." The data are considered on a basis of actual yields and also on a profit basis showing average costs and prices. The State is divided into three regions and on the results of this work a complete fertilizer well supplied with nitrogen and potash, relatively high in phosphorus is considered desirable for the hill section. For the coastal plains soil a complete fertilizer well supplied with all three elements is recommended. On the lowlands area a complete fertilizer well supplied with phosphorus and potash with a high percentage of nitrogen is considered well adapted. The author states that no soil type, locality, or condition in the State has been found which failed to respond satisfactorily to fertilizers used with cotton. This bulletin will be read with interest by cotton growers in the Southwest.

"Potash in Relation to Cotton Wilt," Fla. Agr. Exp. Sta., Gainesville, Fla., Bul. 213, April, 1930, M. N. Walker.

"A Study of the Effect of Certain Fertilizer and Cultural Treatments Upon the Vigor of Young Stayman Apple Trees," Ark. Agr. Exp. Sta., Fayetteville, Bul. 254, June, 1930, C. B. Wiggins.

"Effects of Irrigation with Sewage Effluent on the Yields and Establishment of Napier Grass and Japanese Cane," Fla. Agr. Exp. Sta., Gainesville, Fla., Bul. 215, May, 1930, W. E. Stokes, W. A. Leukel, and R. M. Barnette.

"The Production of Artificial Farm Manures," Iowa Agr. Exp. Sta., Ames, Iowa. Bul. 126, 1930, F. B. Smith, W. H. Stevenson, and P. E. Brown.

"The Effects of Artificial Farm Manures on Soils and Crops," Iowa Agr. Exp. Sta., Ames, Iowa, Bul. 127, June, 1930, F. B. Smith and P. E. Brown.

Quarterly Bulletin, State Board of Agriculture, Dover, Del., Vol. 20, No. 2, June, 1930.

"Analysis of Fertilizers," North Carolina Department of Agriculture, Raleigh, N. C., June, 1930.

Soils

"The Principles of the Liming of Soils," U. S. D. A., Washington, D. C., Farmers' Bul. 921, Edmund C. Shorey.

"Occurrence of Nitrites in Soils," Texas Agr. Exp. Sta., College Station, Texas, Bul. 412, July, 1930, G. S. Fraps and A. J. Sterges.

"Caliche in Arizona," Univ. of Ariz., Tucson, Ariz., Bul. 131, April 15, 1930, J. F. Breazeale and H. V. Smith.

Crops

A six-page leaflet, No. 151, recently issued by the Purdue University Department of Agricultureal Extension on soybeans is one of the interesting publications on crops coming into circulation during the past month. K. E. Beeson, the author, has arranged his material compactly and for the ease of reading by busy growers. Of the plant food requirements of soybeans he says:

"Being heavy users of phosphate and potash as well as nitrogen, it is imporant that the rotation be fertilized to compensate for heavy removal of minerals. This is particularly true where soybeans are grown successively for several years on a thin field in order to build it up. They cannot exercise the maximum beneficial effect upon the succeeding crops if the soil is permitted to become depleted in mineral plant foods."

The other phases of success with this crop, which is assuming so much importance in rotations, are also included in the leaflet.

"Oats with Vetch or Austrian Peas as Grazing Crops for Fattening Hogs," Ala. Agr. Exp. Sta., Auburn, Ala., Bul. 233, July, 1930, J. C. Grimes, W. E. Sewell, and W. C. Taylor.

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Agricultural Developments

(*From page* 42)

was worth at current values—the cost per acre was $54.62 with an acreage crop value of $50.24. In the case of mangels, it cost $72.45 an acre to produce the crop and the yield of 17.81 tons per acre, valued at $1.91 a ton, was worth only $34.02; or, mangels showed a loss per acre of $28.43. Potatoes on the other hand proved a particularly profitable crop, showing a surplus of $97.94 per acre over cost of production; potatoes cost $80.99 per acre to produce and yielding 192.4 bushels, valued at 93 cents, showed an acreage value of $178.93.

POTASH KEEPS APPLES

The amount of potash in the soil of the orchard appears to have an important bearing on the storage life of the apples produced.

Dr. Franklin Kidd and Dr. C. West, of the Low Temperature Station, Cambridge, England, have found that the storage life of apples on which they worked increases as the amount of available potash in the soil increases. Trees grown in soils deficient in available potash yield apples which are particularly susceptible to low-temperature break-down in cold storage.—*Science News Letter*, August 16, 1930.

SMALL BAGS OF SPUDS

Increased use of small packages in marketing potatoes last season is reported in a recent survey by the Bureau of Agricultural Economics. Potatoes in small packages are intended to reach the consumer in the original container without the necessity of reweighing or repackaging by the retailer. Small bags made of cotton, burlap, or other fiber, and also paper cartons are used. The bags or cartons usually contain 15 or 25 pounds.

The survey included 17 cities and compared sales last year with those of the previous year. In eight cities an increase in the use of small packages was reported. In two cities a decrease was indicated. In the other cities the quantity of potatoes marketed in small packages was very slight, or no trend was reported. Boston, Los Angeles, and New York made most use of the small packages. These cities also reported the greatest increases over sales the previous year. Chicago and Minneapolis reported fewer potatoes received in small packages than a year earlier. In most cities potatoes in small packages were only a small part of the supply. This class of receipts was mostly from Idaho and Prince Edward Island.—The Official Record, U. S. D. A., Sept. 25, 1930.

FERTILIZER CONSUMPTION

With an average of 798 pounds of fertilizer used on every acre of crop land during 1929, Florida leads the United States in the use of fertilizer, R. O. E. Davis, research chemist of the U. S. Bureau of Chemistry and Soils, told members of the American Chemical Society, at their recent meeting in Cincinnati. Next to Florida is New Jersey with 417 pounds per acre. On the whole, the States of the Atlantic Seaboard use it much more extensively than those inland, though a great increase in its use has come since 1913 in the Pacific Coast States, and there is also a tendency to increased use in the West North Central States. Cotton uses on an average 108 pounds per acre, though 31 per cent of all the fertilizer used is on this crop. On citrus the rate is 1,163 pounds. Five principal crops consume about 82 per cent of the fertilizer, though less than 25 per cent of the acreage devoted to them is fertilized.—*Science*, Sept. 26, 1930.

American Cotton Deteriorates

By E. B. Ferris

Jackson, Mississippi

THERE seems to be little doubt about the fact that the quality of American cotton is steadily deteriorating. Statistics show that 18 per cent of all cotton ginned in the United States during the 1928-29 season was untenderable, and that this had increased to 24 per cent for the 1929-30 season. Some of this difference was due to more favorable weather conditions in 1928 over 1929; still this could not have been responsible for the entire 6 per cent increase.

The Reasons

There have been a number of reasons for this deterioration: namely, the boll-weevil; the fact that short varieties are earlier in maturing as a rule than those with longer staple; the custom of country buyers of cotton paying as much for one length of staple as another; carelessness in saving planting seed; and last, but not least, the fact that we have allowed our soils to become depleted of plant food by a failure to rotate our crops, grow legumes, and at least to use as much plant food as the crop removes by annual harvest. There is no doubt about the fact that the same variety of cotton grown on rich land will have a better staple than when grown on poor land.

While the grade of American cotton has been decidedly downward in recent years, the reverse is true with that grown by our competitors in foreign countries, who have made prodigious efforts not only to increase the quantity but the quality of cotton grown, although the average of the latter was always below the standard of American cotton.

In order to maintain America's world position in the cotton market, it is most important that we improve the length and quality of our staple; first, by selecting varieties long enough to meet world demands; second, by building up our soils to where all cotton may from the beginning of its fruiting season develop this fruit as rapidly as possible; third, by the exercise of more care in the control of the weevil, even where we do not actually resort to poisoning.

There is no longer any doubt but that the direct poisoning of the weevil is economically advisable; still, there are many ways of lessening weevil damage besides actual poisoning, as the use of larger fields rather than small patches, increasing the number of plants per acre, and quick development of the crop by better fertilization.

The Outlook

The farmer who continues to grow extremely short cotton puts his labor in competition with underpaid foreign workers to a much greater extent than the one who exercises a little more care and grows as good or a better yield from varieties of superior quality. Much of the poor outlook for American cotton is no doubt due to the poor quality we have all but unconsciously come to produce in such large quantities.

Each year a considerable per cent of cotton much shorter than it should be is produced as a result of rust, wilt, and diseases due to the improper feeding of the plant, and could be prevented easily and cheaply by proper fertilization that would prevent premature ripening and opening of the bolls.

The Power Farmer Needs Good Soil

By E. T. Leavitt

Chicago, Illinois

THE advantages of a soil high in organic matter with plenty of plant food available has been particularly apparent the past year in sections affected by drouth. The need of humus to secure high crop yields, both where sold for cash or marketed in the form of milk, eggs, or other livestock products, has been properly stressed; but that it is also essential to the continued profitable operation of power farming equipment has sometimes been overlooked.

Depletion of organic matter has taken place in many sections where fields are rolling to the extent that serious damage has resulted from both sheet and gully erosion. This has not only lowered yields but has made terracing necessary in order to keep surface soils from washing away. It is extremely difficult if not impossible to operate binders or any other of the larger power tillage or harvesting tools in fields cut by gullies.

C. A. Bacon, a member of the American Society of Agricultural Engineers and an authority on soils in relation to tillage problems, has found in his investigations that costs of plowing and other operations for seedbed preparation may be substantially greater where soils are low in organic content. Where soils have sufficient humus, the power required for plowing is much less. It has also found that in soils where difficulty was experienced in getting plows to scour, the addition of organic matter to bring the content to four per cent and the correction of soil acidity eliminated the sticking condition. Neither the size of the plow nor its shape caused failure to scour in soils which contained three per cent organic matter.

In corn borer territory it was found that plowing alone was not sufficient to thoroughly cover the corn-stalks in heavy soils lacking in humus. When these soils were turned either too wet or too dry, large holes were left through which the moths easily emerged.

Passing of the tractor wheels over the soil was found not to injure crop yields in clay soils when plowed dry or even in a moist condition, where the organic content was six per cent to a depth of 11 inches and was found actually beneficial in sandy soils with 3½ per cent organic matter.

Harrowing the ground low in humus did not maintain an effective mulch, but in soil containing four per cent organic matter the capillary action was seriously restricted. Corn planted in the latter field showed slight evidence of drouth when corn in the plots containing two per cent organic matter withered.

Upstanding and early maturing crops which result from being adequately fed are also necessary for the economical use of the corn picker, the binder or the combine.

Livestock manures in the limited

A grain drill with a fertilizer attachment means greater yields with lowest cost of fertilizer application.

quantities which are usually available have not been found sufficient without the use of legumes. These are heavy feeders of calcium, phosphorus, and potash which must be supplied in adequate amounts if the plants are expected to thrive. On the 40 year-old experimental plots at the Pennsylvania Experiment Station it has been found that with a rotation of corn, oats, wheat, and hay, the organic content of the soil was maintained by the application of 100 pounds potash and 300 pounds of superphosphate applied every other year.

J. W. White, professor of soil technology, Pennsylvania State College, also points out the possibility of quickly building up the organic content of the soil with bluegrass pastures. Referring to the tests at this same station, he finds soils in permanent grass gained 20,329 pounds an acre of organic matter in eight years as compared to 9,675 pounds in the rotated plots. Each soil was treated with limestone, superphosphate, and potash.

Recent experiments which show the advantages of feeding the crop in the row as with potatoes and wheat or in the hill as with corn have brought about improvements in planters equipped with fertilizer distributer attachments so that larger applications of highly concentrated fertilizers may be more safely applied without injury to the seed. According to Professor H. H. Krusekopf, soils department, University of Missouri, the time has come in that state when a grain drill without a fertilizer attachment must be considered only 50 per cent efficient. With this attachment for his drill he believes that the farmer not only receives the greatest return from his fertilizer investment but also has the least extra expense for power and labor in its application.

Chlorate Weed Killers

By E. N. Bressman

Oregon Agricultural College

The chlorates are still considered the most effective killers of all perennial weeds. Remarkable kills have been obtained with these sprays in all parts of the United States. Even in California, where weed eradication is difficult because of favorable climatic conditions, perennial weeds have been eradicated by the use of chlorates.

Almost every experiment station in the United States has been conducting trials with the chlorates for killing perennial weeds. These trials have given additional information which is of value to chlorate users. Effective methods of application have shown that the amount of spray may be reduced. A boom nozzle attachment for a power spray outfit assures 100 per cent coverage of the spray on the weeds. One, three, or five nozzles may be placed 14 inches apart on the boom. Four feet of ¼-inch pipe covered with rubber serve as a handle for the boom. This home-made device will be widely used in the West.

The other important change in chlorate recommendations applies to the time of application. Chlorates may be applied from the blooming time of the weed to the end of the growing season. Late applications, even after severe frost, have been effective. It seems that the applications in the fall require less chlorate to get satisfactory kills. In most cases fall applications have no effect on the crop planted the next spring.

Calcium chlorate reduces the fire hazard, always present when sodium chlorate is used. In hot, dry sections, however, users of calcium chlorate should use precaution against fire.

The Unseen Half

(*From page* 26)

fall these grasses come back surprisingly well. It is a remarkable root system which allows these grasses to continue year after year under extremely adverse conditions.

Alfalfa has one of the most remarkable root systems of any of our cultivated crops. It is not uncommon for the root system of this crop to reach a depth of 40 or 50 feet, and even the first season the roots of the little plant, which is no higher than 5 or 6 inches, may reach a depth of 6 feet and will more than double the second season, producing a normal crop under ordinary conditions.

Recent work at the Nebraska station shows that this extensive root system of the alfalfa plant dries out the subsoil rather rapidly, particularly under upland conditions and that crop yields decline very abruptly after 4 or 5 years of cropping. They find that on upland soil the restoration of this moisture at depths below 5 feet is very slow and that under their conditions it would require about 225 years to replace the subsoil moisture which has been taken away by 6 years of growth of the alfalfa crop. This depletion of subsoil moisture may account for many alfalfa failures on upland soils after the crop has grown for 5 or 6 years. Of course in these cases it is best to grow crops such as the cereals which feed mainly on the first 3 or 4 feet of soil and take advantage of the rainfall which is obtained each year.

Potatoes do not have as extensive a root system as the other crops previously discussed. As a rule, the true roots of the potato plant do not grow down much more than 3 or 4 feet in depth. In the early growth of the plant when cultivation is carried on, most of the roots are in the first 8 or 10 inches. It is apparent that cultivation should not be too deep at this time, but should be designed so as to keep the upper soil layers mellow for proper development of both roots and tubers. Roots should not be injured and tubers should be kept covered so as not to be exposed to danger of frost or sun.

Renewing the Lease

(*From page* 13)

Mineral fertility alone has always given a large swell in yields during latter June and early July on account of the clovers present. With the turf built back again to production qualities, it may be predicted that nitrogen will make an outstanding showing on this pasture in the future. All indications favor that point of view this, the fourth season.

Even though the effect of nitrogen has not been to increase yields materially beyond mineral fertilization alone on this pasture, earliness of grazing is a factor to be considered. In 1929, the nitrogen fertilized plats had produced 526 pounds of dry matter an acre more than the phosphated, potashed, and limed plats up to June 1. In 1930, the difference was 429 pounds. This is enough feed for one cow for about 15 to 20 days, and it is a common observation in this section of the country that nitrogen fertilized grass can be grazed at least two weeks earlier.

Protein production in nitrogen fertilized grass is also a decided advantage favoring its use on pastures. On a second pasture under fertilization treatment, where the natural mineral fertility was at a medium level, 60 pounds of elemental nitrogen in ammonium sulfate made in two applications of 30 pounds each, the season's

yield of dry matter produced 1,029 pounds of crude protein an acre. Complete mineral treatment on this same pasture yielded 696 pounds of protein during the same season, while no treatment gave 326 pounds. It would appear that nitrogen fertilization of pastures is an economical way to get protein, and that the grain ration fed to dairy cattle pasturing on such grass might readily omit the high-priced, purchased protein.

In the writer's judgment, the pasture referred to in this discussion is typical of thousands of acres that cannot be restored in the short space of one season. It takes time to build back what it has taken years to deplete, and this means consistent fertilization to compensate for what has annually been removed through grazing.

Reviews

(*From page 46*)

Economics

"Prices of Farm Products in Utah," Utah State Agr. Col., Logan, Utah, Bul. 217, June, 1930, W. Preston Thomas.

Insects

"Control the Cabbage Root Maggot," N. J. State Col. of Agr., New Brunswick, N. J., Ext. Bul. 74, April, 1930, Prof. L. G. Schermerhorn and C. H. Nissley.

Diseases

"Timber-Rot in the Pepper Tree, Schinus Molle," Ariz. Agr. Exp. Sta., Tucson, Ariz., Bul. 132, May, 1930, J. G. Brown.

"Cotton Diseases in Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 214, May, 1930, M. N. Walker.

"The Sugar-beet Leaf-spot Disease and Its Control by Direct Measures," U. S. D. A., Washington, D. C., Cir. 115, April, 1930, G. H. Coons, Dewey Stewart, and F. G. Larmer.

From Peaches to Wheat

(*From page 27*)

tion at that point. Mr. Baird has a spur track on his farm and delivered the wheat to the railroad last June from his surrounding fields, obtaining approximately $1.22 per bushel f.o.b. his farm. This gave him an average return of $40.26 per acre and a very nice profit on his investment. A flour mill at Macon, Georgia, 30 miles away, contracted for his entire crop, and the price which he received was predicated on the basis of Chicago prices plus freight to Macon, Georgia.

Mr. Baird produced more than three times the average yield of wheat in Georgia by first growing a good crop of Otootan soybeans which was turned under in the fall of 1929 just before the wheat was sown. Then in the spring of 1930 he applied 200 pounds per acre of a 9-0-10 (NPK) top-dresser. Superphosphate was applied to the preceding crops. Mr. Baird attributed a large measure of his success with wheat to the cover crop of soybeans which was turned under. He stated that potash as a top-dresser gave him increased yields and wheat of better quality.

He conducted a test in 1929 using 100 pounds of muriate of potash as a top-dresser in addition to 125 pounds of sulphate of ammonia per acre and found that the extra potash increased his yield from 24.3 bushels per acre to 30.1 bushels and also increased the weight of the wheat per bushel.

A number of farmers in central and southern Georgia have recently become interested in the production of wheat on account of boll-weevil damage to cotton. Mr. Jim Kelly of Tennile, Georgia, averaged 33 1/3 bushels of wheat per acre in 1930 and the average weight per bushel was 59½ pounds, which is considered excellent quality for that section. Mr. Kelly, like Mr. Baird, used a cover crop of soybeans before planting the wheat and then top-dressed with 200 pounds per acre of 9-0-12 (NPK).

The home of Mr. Baird at Edgewood Farm, Fort Valley, Georgia.

The Inquiring Mind

(*From page* 20)

the harvester manufacturing business.

It was through the influence of F. B. Swingle, now one of the esteemed editors of the *Wisconsin Farmer and Agriculturist* at Racine, that Mr. Appleby presented his first twine knotter to the Wisconsin State Historical Library Museum at Madison.

But Appleby was not the only solver of the "knotty problem." In the museum of the agricultural engineering department of the Wisconsin College of Agriculture at Madison may be seen today two old twine knotters which were obtained by Professor E. R. Jones, chairman of the department. They were made by Joseph Barta of Bangor, Wisconsin. One of them was patented in 1866, the other in 1872.

Barta, who was a Bohemian music teacher, came to Hillsboro, Wisconsin, in the fifties, and finding few students, while he was learning the English language, worked in the harvest fields for money to pay expenses. There, the severity of the work, which lamed his back and wounded his tender fingers, led him to seek some method by which bundles might be bound by machine instead of hand. I fancy he, too, sat on an old railfence and played on his violin the tune of a jingle like that of Appleby's, while the two puzzled over the same problem quite unaware of each other's existence.

At first Barta worked with discarded sewing machines and at length devised a knotter of stitching pattern. In this he interested four partners who backed him with their money, and in 1863 all of them worked away seeking a more practical device. They succeeded, got their new contrivance to bind a bundle, and on May 15, 1866, were granted for it U. S. patent No. 54,672. Their machine automatically raked the grain from the upper platform into a binding basket, bound it with twine, and tied it with the knotter.

Professor Jones told me that the first field test of Barta's original twine binder was made in 1866 on the McCumber farm two miles east of Bangor. Its work was somewhat unsatisfactory. Sometimes it worked well and again it didn't; so the inventor kept tinkering with it until 1871.

Then he and his partners decided that a practically new design would have to be made. Money having been contributed by friends, the work continued and in 1872 a new revolving knotter was perfected in place of the original one of sliding shuttle type. When tested in the harvest field, the new machine did perfect work. The demonstrations which followed were watched by the farmers of the district and by at least one outsider who keenly followed its every motion.

During the next six months, working leisurely, a La Crosse firm produced 15 Barta knotter binders then suddenly a new knotter of Barta type, but with enough differences to make it patentable, appeared and put an end to the prospects of Barta, his partners, and financial backers just when they expected to reap a well-earned reward. It has been figured that each of the knotters patented by Barta cost some $25,000, so the loss was great.

Barta lacked the business acumen of Appleby and gained nothing from 20 years of strenuous experimental work. He died at St. Paul, Minnesota, in 1880 a tired, disillusioned, disappointed, almost penniless old man.

It was Appleby, not Barta, who was fortunate in attracting the attention and obtaining the cooperation of William Deering and through him attaining fame and a competency. He had spent much time in devising and popularizing the wire-knotting binder before he recognized the superiority of the twine binder and concentrated his efforts on that. Barta, on the contrary, and greatly to his credit, believed in the twine knotter from the first, never lost faith in it, and unlike Appleby, patented his inventions but unfortunately gained no reward for his splendid work.

Barta and Appleby both deserve credit as originators of the knotting devices now in use. It seems likely, too, that many other inventive geniuses helped in the work, but they are never mentioned today. Professor Jones once told me that probably 1,100 or more men contributed to the perfecting of the grain harvester during the fifties, sixties, and seventies.

Of the knotter makers of this noble band of inventors, Appleby seems to have been the only one given public recognition. He has passed on, but at the Houghton Farm where he worked may be seen a tablet, placed there in October, 1926, which bears this inscription:

"On this farm John F. Appleby made the first knotter in 1858."

All honor to all of the great men of the past whose eminent work and skill gave us the efficient self-binders of the present day which, as F. B. Swingle has happily said, solved the problem of *unbending backs at harvest time.*

Lawn Care

(*From page* 29)

It is far better to purchase a good lawn mixture at a reasonably high price from a reliable seed firm than to buy poor seed of unknown mixture. Study the seed label and insist on pure seed. Home-mixing can be practiced and is not much of a trick. Measure the lawn, or estimate the size, then go to a reliable seed dealer and purchase bluegrass seed at the rate of three-fourths pound and one fourth pound of red top for every 500 square feet of lawn. Mix the two thoroughly and sow one pound of the mixture per 500 square feet. The red top germinates quickly and makes a temporary turf that will later be crowded out by the bluegrass.

For shady spots add to the bluegrass-redtop mixture an equal quantity of rough stalked meadow grass, commonly called *Poa trivialis.*

The best time to sow lawn grass is in the fall. Fall seeding has the advantage over spring seeding in that weeds do not crown the grass when it is making a start. Spring seeding places the tender grass shoots in direct competition with the hardy weeds that naturally grow during the spring or early summer season.

The question is often asked, does it pay to reseed the lawn every year? If there is a stand of bluegrass, it should not be necessary to reseed. Of course if the turf is a stand of timothy, the product of cheap seed, then reseeding with good bluegrass is necessary. Once bluegrass has become established, greater returns can be looked for from money spent on fertilizer than from money invested in annual seedings. The weeds will begin to disappear as the fertilizer encourages bluegrass growth and forms a heavy weed-proof turf.

It is a mistake to expect the weeds to disappear after making an application of ammonium sulphate. It is not a herbicide, but merely a stimulant to the grass. It makes conditions unfavorable for most of the broad-leaved weeds. This new practice will do away with the back-breaking labor of digging out weeds and at the same time result in a beautiful mat of bluegrass which is so essential and pleasing to the eye. One can well be proud of a good lawn and look upon it as a masterpiece of art.

Due to Details

(*From page* 30)

previous to planting. The other half was applied in the row with the planter.

After planting the field was bushed twice just before the potato shoots showed through. The bush used was the common birch bush or brush. Such an instrument levels the soil and kills the small seeds.

As soon as the rows showed a prout hoe was used to cover the plants somewhat and particularly any weeds in between plants. In five to seven days a riding cultivator was used and in a week or ten days the prout hoe was used again. Hilling was practiced somewhat with this prout hoe. There are no weeds in the row or between the rows after this type of cultivating. There was a ridge of dirt about five to six inches high around the potato plants. The potatoes grew fast, and without weed competition came through in excellent shape.

Weekly spraying of the potatoes took place, starting when the plants were from six to seven inches high and continuing until about the middle of September. Thus eight sprayings or more were applied. A four-row sprayer, three nozzles per row, was used, and a 150-pound pressure or more at all times was carried.

The Bordeaux mixture used was home-mixed, care being exercised to keep the milk of lime and the bluestone liquid separated or diluted by pure water. Each spraying required from 75 to 100 gallons of Bordeaux per acre. As the plants increased in size, more material was used. A slight increase in the strength of the material, that is bluestone or lime, was also made.

The crop was harvested and placed in a new storehouse erected on his farm, and was sold at good prices throughout the winter. Mr. Pease says his results are entirely due to timely and thorough attention to the details of potato raising.

Paul Wagner

(*From page* 44)

It is needless to embellish the memory of Paul Wagner with any phrases of appreciation. Agriculture owes him the creation of scientific foundations of plant nutrition which have added considerably to the increase in crops. Therefore, the work of Paul Wagner gained also importance for the artificial fertilizer industry. Up to this day the scientific methods of Paul Wagner are considered to be of great value to agricultural science in field and greenhouse research.

The amiability of Wagner in which the wisdom of age was coupled with a rare youthful elasticity will live on in the memory of all those who had the benefit of knowing him.

EDITOR'S NOTE: More incidents in the remarkable life of Paul Wagner, who is so well-known among our soil scientists and whose work has had such an important bearing upon our agricultural science, are found in an article by Geh. Regierungsrat Professor Dr. Gerlach, Berlin, published in "Die Ernaehrung der Pflanze," March 15, 1923:

"In the fall of 1922 the director of the Agricultural Experiment Station of Darmstadt, Professor Dr. Wagner, was able to look back upon an activity of 50 years at that institute. In a few days he is going to celebrate his 80th birthday. Behind him is a life of work, but also of success, and his name is widely known. Petty persecutions, mostly caused by envy and jealousy, were not spared him either, but he always keeps his cheerful smile and looks at the stormy life of the present more mentally alert and physically fit than is usual in the research scientist, and is always willing to continue to take part in the solution of important problems with regard to plant nutrition.

"Paul Wagner was born on March 7, 1843, at Liebenau in the Province of Hanover. He studied chemistry and pharmacy in Erlangen. After passing the state examinations he devoted himself to agricultural chemistry following the advice of the Professors Zoeller and Gerup-Besanex of Erlangen and entered the agricultural chemical laboratory at Goettingen as an assistant where he worked five years and occupied himself particularly with work on plant nutrition. In the spring of 1869 he wrote his thesis for the doctor of philosophy on 'Nitrogen Plant Food.' In 1871 he took up his residence as lecturer at the University of Goettingen. But in the fall of the following year Wagner took over the direction of the 'Agricultural Experiment and Information Station' in Darmstadt. This institute was founded in 1871 with the help of contributions from various corporations, especially agricultural associations, the Bank of Trade and Industry, the town of Darmstadt, and the Hessian Ludwigsbahn (Railroad) amounting to 3,630 florins and the granting of a flat amount of 2,800 florins by the Duke of Hessia for its outfit. Dr. Ernst Schulz was the first director of the institute. However, in 1872 he was called to Zurich and his successor was Dr. Paul Wagner.

"As with most of the experiment stations at that time, the Darmstadt institution also was installed at first in private quarters. There were only a few laboratories and no greenhouses and experiment fields and the activities were restricted to the examination and control of fertilizers and feedstuffs and to information. Wagner occupied himself at first with the improvement and revision of analytical methods of investigation. In 1872 he published the book, 'Manual of the Manufacture of Fertilizer and Instruction for the Investigation of Commercial Fertilizer.'

"But very soon Wagner had a great desire to investigate by scientific research work the effect of the plant foods contained in the soil and in the fertilizers. After a short time he had the conviction that the field experiment carried out at that time in an exceedingly simple manner was not satisfying. It seemed to him to be difficult to carry out simultaneously and in a short time so many field experiments as were necessary to solve the respective problems. He saw the disturbing influence of the weather, unequalities of the soil, damages, and other inconvenient influences on the growth of the plant, and he learned that the results attained were so far only of local importance.

"It was necessary to find an exact research method based on a scientific foundation making the carrying out of a large number of single experiments in a small room possible and eliminating disturbing side effects, so that with the equalization of all the most important factors of growth only one of them was changed. To attain this, the pot experiment seemed to him to be the most suitable means.

"Wagner defended his new research method energetically and at the same time criticized thoroughly the field experiments carried out hitherto. At first his statements and suggestions did not find recognition by all agricultural chemists. On the contrary, they were strongly contested by some of them, and a vivid argumentation on this subject arose. In order to carry out his plans, the rooms and equipment of the agricultural experiment station were no longer regarded adequate by Wagner, but he soon succeeded in getting the Hessian Government interested in his research method and in having a new institute built in Darmstadt which had beside large, well-equipped laboratories, a large vegetation station and a garden for experiments. In the course of time this plant was considerably enlarged. At the present time the Institute of Darmstadt is still one of the best equipped agricultural experiment stations and is a model to many institutes in the inland and

A laboratory at Darmstadt. In the background (left to right) are Professors Wagner and Roessler.

abroad.

"Wagner developed a zealous and untiring activity. He had more and more success with his exact research method, but the argument whether pot or field experiment was still continuing. At the end of the eighties, Maercker, who was particularly interested in the field experiment, went to Darmstadt to see his friend. He returned to Halle full of enthusiasm and there built a greenhouse after the Darmstadt model. On the other hand, Wagner later on used the field experiment—which he never entirely rejected—to a great extent in order to enhance and to improve our knowledge with regard to the fertilizer theory. Nowadays no institute working on plant nutrition can do without these two methods of research which are of equal value and which complement each other. Therefore, they have to have the necessary equipment for both in order to work successfully.

"After Wagner had obtained the scientific basis for further investigations on the influence of fertilizers in different soils by his pot experiments, he turned again to a greater extent to the field experiment in order to study the fertilizer requirements of the Hessian soils and to gain the basis for a practical fertilizer theory. The number of these experiments is very high, and their execution lasted generally several years. The cooperation in these experiments of the Hessian agricultural field tutors (Wanderlehrer) and the support of the Deutsche Landwirtschaftliche Gesellschaft (German Agricultural Association) as well as other corporations was of great value to Wagner.

"The experiments of Wagner showed that the results of pot experiments are in close relation to those obtained by the field experiment. But they also demonstrated that the fertilizer need of the different soils varies considerably and is influenced not only by the quantity and solubility of the plant foods contained therein, but also by the weather, the rotation of crops and other factors which are eliminated by the pot experiment. The scope of this article does not permit a more detailed discussion on the field experiments by Wagner. They are carried out with the utmost perfection and are of great importance, not only for Hessia, but also for all Germany. I do not know of any research scientist who supplied such copious, valuable material on this subject.

Direct Methods

"The great success of Wagner's activity is based on the simple and clear questioning, the selection of suitable research methods, the careful execution of the experiment and their scientific exploitation, the correct interpretation of the results of the experiments, the comprehensive arrangement of the material, and the brief and clear demonstration by summarizing the most important results in a few striking figures and the addition of excellent photographs. Pictures are made in the background of which the whole arrangement of the experiments can be seen, but the results of them are pointed out distinctly and in a plastic way through their depth. Wagner's writings are widely disseminated and are even known to the circles of the small farmers.

"The exact research method worked out by Wagner is still today applied everywhere. The attempt to improve it was made. Particularly known and of importance are the intelligent investigations and mathematic foundations for further scientific work in this line by Mitscherlich. From a theoretical point of view the work of Mitscherlich is very valuable and can be developed, but so far Wagner did more for practical use. Up to this day he is working eagerly to advance agriculture and his standpoint with regard to new theories shows that he not only disposes of an excellent material, but also knows how to use it intelligently, in order to contest the viewpoints of his opponents. Honor was conferred to a great extent upon this meritorious

research scientist. In 1881 he became professor and in 1897 "Geheimer Hofrat (Privy Councillor). At the beginning of this century the Technische Hochschule (Technical College) in Darmstadt bestowed the title of Dr. ing. h.c. upon him. He refused the invitation to join the Biological State Institute in Rahlem as Director, as he did not want to depart from the beautiful experiment station and his comfortable home in Darmstadt."

Selling an Idea

(*From page* 16)

Before leaving the community, however, it was learned that the Federal Land Bank had never had a foreclosure in the Angier section. A local representative of a large money lending insurance company said he had never had a foreclosure in 14 years, and the North Carolina Agricultural Credit Corporation representative said the Angier farmers were the first to pay up every year and the credit corporation had never lost a penny of its loans.

Back in Raleigh again, I talked to a banker about the fine things I had seen that day. "You are right," he said, "we loan those men thousands of dollars every year and we have never lost a cent."

It then dawned on me that in addition to tobacco, I had seen gardens by nearly every home. The farm houses and buildings were painted and well kept. There were poultry and hogs, cotton, corn, and soybeans. There was a fertile soil handled well and I thought then that these folks lived in a kingdom of plenty crowned with a golden coronet of yellow leaf. I said as much to Jackson. "Sure," he assented laconically, "they know how to fertilize."

A New Food Plant

(*From page* 17)

least one of its natural hosts can be easily transplanted and can be established in any suitable sand hill region of mild climate.

The Ammobroma seeds germinate three to five feet below the surface of the ground and grow into the roots of a small, inconspicuous desert shrub known as the Coldenia. To some extent it grows also on the desert Eriogohum. The flower stalk grows from the roots and extends to the surface where the plant forms a flower similar to a sunflower head resting on the surface of the sand. The flowers are sand colored and one must look closely to locate the plants. Once found it is easy to pull the stalks from the ground.

In addition to the roots growing into the host plant, Ammobroma has free roots capable of absorbing soil moisture and minerals discovered in it, but it has no green coloring matter and can not manufacture its own food.

Perhaps because of its independent root system and method of storage of water in its thick, fleshy stems, the Ammobroma is able to produce a large crop of palatable human food with a very small rainfall. In the spring of 1928 an enormous crop was produced in the sand hills east of the Imperial

Valley, California, with a total rainfall from October, 1927, to March, 1928, of about four inches.

What is regarded as the most interesting feature of this discovery is the possibility of making the Ammobroma more accessible to the Papagos, and many others including farmers who have dry, sandy soil with little rainfall. The shoots can be canned for market which would make a new industry.

Dr. Walter T. Swingle of the Office of Horticultural Crops and Diseases for several years has been cooperating with the Office of Indian Affairs to secure plants that would prevent famine on the Papago Indian reservation in years of drought. About 6,000 Indians live in an area where hardly 600 white men could hope to survive. Failure of the desert crops often imperils their food supply. On discovery of this natural crop the Government has taken steps to improve the growing, harvesting, drying, and canning of the Ammobroma, which in seasons of drought might enable the natives to store sufficient food to tide these Indians over seasons of want.

Better Crops in Russia

(*From page 9*)

greatly differs according to different regions. In the basic grain regions 50 per cent of the peasants are already working collectively, and in some cases 70 and 80 per cent. In the non-grain regions this per cent decreases to 20 and even to 7-8 per cent. But there is no such region all over the Union, where a considerable number of collectives has not been found this year (1930)."

No one knows whether collectivization of farms according to the Soviet plan will be finally successful, but in event of success what are the possible advantages of such a system? First, a system of land utilization can be worked out according to the best information in the hands of agronomists and economists. The several crops can be restricted to those soil types and climatic conditions for which they are best suited. For example, areas fit only for timber would be used for that crop, thus eliminating much marginal land from agricultural utilization. Conversely, land now in forest but perhaps better adapted to tilled crops would be cleared and put to better use. Likewise, areas suitable for winter wheat, maize, sugar beets, etc., would be defined and used for those crops when economic conditions warranted them. Second, since the government owns all the land and manages the collectives, it will be possible to grow the best varieties known to specialists. The best quality of seed obtainable may be used over wide areas. Further, the best known practices regarding tillage and the use of fertilizers may be applied uniformly in any given region regardless of its extent.

And all these practices may be introduced simply by orders from the proper administrative officers. It will not be necessary, according to the Soviet plan, to go through the tedious and expensive processes of education. Again quoting Volf: "Passing by a whole series of intermediate epochs the primitive economy of the peoples . . . leaps at one stroke from the primitive technics inherited from olden times to the up-to-date technics created on the basis of the latest achievements of the world's science, and simultaneously passes over from the minutest individual farming to a large scale socialistic one."

In other words, agricultural practice will be introduced and regulated by decree rather than by evolution through education, imitation, and propaganda. Agricultural science will surely have its day in Russia. All the scientist

will have to do is to prove to the satisfaction of a critical administration that a certain practice is the best, and that practice will be ordered. But the scientist must be very sure of his ground, for along with his great privilege of guiding agricultural practice of large groups and immense areas goes great responsibility—*noblesse oblige*.

One may go on almost indefinitely pointing out advantages that theoretically would accrue from collectivization and state administration of farms. It makes one dizzy to contemplate them. Are they too Utopian for realization? Will they succeed in spite of many obstacles? Will Russia thus become the chief granary of the world, a great producer of cotton and manufactured cotton goods, an exporter of sugar, citrus fruits, etc.? Surely there is for the American farmer much food for thought in the Soviet agricultural plan. Its development should be followed with the keenest interest. We can hardly afford to stand by with an attitude of smug complacency and say it can't be done.

To carry out this colossal agricultural program, the Soviet government needs to build up an army of technically trained men and women. On that account the business of agricultural education is booming in Russia. The State Planning Committee assumed that 51,000 qualified specialists and 235,000 workers of average qualification would be required by 1932-33. Members of the Soil Congress visited the Timiriazev Agricultural Academy near Moscow. Before the World War this academy had 1,300 students, now has 4,000, and dormitories are being constructed to house 10,000 students. There are 30 schools of this type in Russia. In 1929, 23,000 students were admitted in the upper and middle schools and in 1932-33 it is expected that 102,000 will be admitted. Thus, the Soviet government is aiming at mass production in agricultural education as in agricultural production; the former is prerequisite to the latter.

Hardscribble Grit

(*From page* 4)

anxious brood all about the land and the neighbors, and they decided to venture on the long trip of eighty miles just as soon as Dad had filed on the government claim.

Here was a picture indeed! At a time when the brainy young men of substance and ambition were turning away with restless mien from the well-worn local paths and were complaining that there was no available land left on which to expand and found dynasties, this tired but eager fellow sat within his family circle with exuberant fancy. His joy was apparently infectious, for wife and children began to pack the few household belongings in eagerness to depart on the high road of new adventure. Even the rag dolls and the mongrel dog partook of the delight.

Now let it be fully understood that this man and his family were not morons or outcasts; that they were native stock of the same kind as ours, but with a mettle and a spirit that all the fires of failure could not crush. I am not relating to you an exodus of the Jukes, but an epic of such grit as few of the fat-landers possess.

He did not stop to cast a ballot or berate some politician who had failed to make good on farm relief promises. All he did was to lock the door of his one-time domicile, harness the nag, load up his stock of possessions, top them off with his family, and drive ahead in grim expectancy.

I do not know whether he belonged to the Farmers' Union or the Grange, the Equity, or the Farm Bureau, but I do know that he belonged to the Immortals. Forty-nine years, two hands, a lame back, and a skull full of pluck! That's what the Master Misfit took with him to the unclaimed claim located in a county with forty thousand inhabitants. If you ever hunted for a nickel on a circus lot two days after the kids had scoured over it you know what he found!

AND the climax of it all is that he *was* satisfied, his family was satisfied, and they *remain* satisfied to this very day you read it. But I must not anticipate, except to warn you that there is no failure for a man with such a brand of courage and devotion. If there ever was a chap who shames those querulous fat-landers who are always kicking about depression and farm woes, my friend is that man.

Money had to be found with which to make the hegira into the new haven. The little bluff place was offered to all comers at six hundred dollars, with no takers. The old neighbors croaked dismally of the land toward which the family had set their faces. It was either peat swamp or blow sand, they predicted. Resolutely the Head of the Family cashed in for the venture by selling his only cow for fifty dollars and borrowing another one hundred dollars from somebody willing to take the bluff farm as security.

They arrived in the vicinity of their venture and borrowed beds at the home of a hospitable neighbor for a few days. The wife was equally courageous, for she was more than fifty years old. The eldest child was fifteen and there were four more. Had they not met kindly neighbors their capital of one hundred and fifty dollars would soon have vanished.

Real neighborly feeling sprouts and thrives best under such conditions. I have observed it in a like manner as a boy living on a Dakota homestead, where it was sixty miles to a doctor and five miles to water, "up, down, or sideways."

About four miles from the claim stood an abandoned hewn log cabin, a story and a half high, which was mute evidence of somebody else's failure. Nothing daunted by portents or "signs," the homesteader bought the cabin for twenty dollars. There must have been something appealing about him, for all those hill-billy neighbors hitched their ponies to the shack and fetched it over the roads to the new site free of charge.

"I just know we are going to love our neighbors, and it won't take the reading of scriptures on Sundays to make us do it either," remarked the hero to his family the first night they snuggled into the rude shelter.

SO here they settled down, amid the blueberries, the scrub oats, and the trailing arbutus. A few acres had been cleared before they came, so they hired it plowed and harrowed, and planted corn, potatoes, and garden truck. A source of soft water was found at a depth of about fifty feet. The cabin had to be chinked. The wife improved daily, our hero noted. A small stable was built for the gray horse. Two barrels of snow apples and a coop of Leghorns were unloaded and added to the largess of the larder.

When the little tads started to school over the sandy roads that fall, the teacher asked them, "Do you belong to the old man that has moved into the brush on blueberry hill?" Even the old timers in those parts had not realized that the blueberry bluffs were government land. They knew that the government wards, the Winnebago Indians, pitched their camps there; so that was enough to put the seal of inferiority on the tract.

As protection against sudden forest fires, the family set to with a vim and hacked away the brush that choked the premises. Sound deadwood was chained into piles. Some of the trees had been blasted by old fires. A pile of marketable logs were laid up in a

There is always a thrill in the first snowfall.

few weeks and from this came the first income. The logs brought about twenty dollars.

That fall Providence was with the hero, and he praised the Lord for deliverance. A dry summer was followed by fierce fires in the slashings. The onrushing flames came swooping over the blueberry ridge. The hero and a neighbor hastily plowed a couple of furrows around the little cabin home. A few minutes more and the inferno jumped upon them and destroyed the wood-pile and all the corn-shocks. Only the cabin itself, the rude hen house and the stable were left. Friends came and helped beat out the cinders. But optimism could not be downed. "All my brush has been swept away and much of my land is cleared, with plenty of ashes to be plowed down into the starving soil!" How's that for high degree confidence?

HOW easy it was now for people to visit them. No brush to scramble through, few logs to clutter the path. Plowing was easy now for the old horse and the wiry little hero. The fires were followed by untold amounts of blueberries. The following spring pickers came from afar, and the family sold nearly one hundred dollars worth of these acid soil nuggets.

"Now we can rush things a trifle," remarked the settler when he had finally sold the former farm for four hundred dollars. With this he hired more acres plowed, bought some strawberry plants, a cow and a calf, some seed corn, and a phonograph! Seemingly this man was not addicted to the fiddling habit like the stories related of the Arkansas homesteader. His music was in his soul and on records.

I regard that phonograph as symbolic of the great discussions we have been having incidental to the country life movement, the standards of living, culture in the sticks, and so forth. It was before the days of the radio, or probably that item would have been secured at all hazards.

Personally I think that phonograph helped make "Ma" better. Maybe that's why he picked blueberries a week to get it. I do not know anybody more entitled to those scratchy cylinder records than the family under discussion. I resist all criticism of them based on extravagance. Canned polkas were of greater aid on a cut-over farm than canned peas—sometimes. Isolation no longer worried them. The automobile had become a necessity in those diggings and folks flocked from near and far, passed and repassed as the roads improved. They had no car nor did they envy those who bumped along in second-hand outfits. They enjoyed the motor maze because the hero said it brought people up past his shack, and a few of them stopped to buy strawberries, eggs, or chicken meat. Absence of envy is not wholly a mark of no ambition, although you may think so. I know it is hard to swallow that idea in the midst of an American depression fol-

lowing roaring prosperity and installment buying.

Three years later the beneficent government land office yielded up the clear title to the land which the family had squatted upon. By this time the farm had mostly emerged from raw to revenue, with fruit, eggs, honey, and vegetables as cash crops.

TODAY the man is more than sixty years old, his wife and children are all living, and they own their own car and drive it, too. So indomitable is his spirit that he vows with a "vum" that he would take a hundred dollars cash and go out to any virgin tract in the state to win all over again. His certified potatoes on fertilized land, his hives of bees, a small orchard and everbearing strawberry plantation, his five cows and a flock of sheep—plus the phonograph *and* a radio set, could there really be more honest cause for good cheer?

I presume that he *does* add to the surplus of food when consumers are the dominating force in the market on a dull reaction. But I likewise affirm that he has added manifoldly to the surplus of optimism, an article which is never a drug on any market.

Economists of the class-room brand will violently disagree with any principle connected with taking up submarginal land, such as I have related. They will argue that there is already too much good land poorly worked and often under-capitalized, with too much working loss chalked up against agriculture as it is.

But agriculture represents two kinds—mass agriculture and individualistic agriculture. I am very much afraid that what is proven wise and good for mass agriculture never will become a guiding star for individualistic agriculture.

When men seek a home and staple food, solid comfort and family security (however humble) they are very apt to disregard entirely all the noble tenets taught in schools of economy. I am afraid that my friend, the homesteader, would not have improved upon his technic or his intentions after taking a thorough course in economics —had he faced the same bitter necessity.

I do not believe, of course, that the government should deliberately seek to inveigle such folks out onto large and visionary reclamation areas; but in this case the government actually hid away the claim which our hero found. The government cannot either be blamed or praised for any hand in his rejuvenation.

Similarly, I often wonder if the government or economists can be credited much for settling all of rich Iowa or Illinois, or any of the tract once regarded as the Great American Desert. It was individualistic agriculture, urged on by courage and need, that brought the prairies under the plow. The only difference between them and our hero was that they had better picking. He established a home, and what more can be said for most of the pioneers?

AND so this is the story of the Master Misfit who became almost a Master Farmer in his own small way. Maybe if we should scan very minutely the real difference between the successful farmer and the reverse, some consideration would be given to spiritual qualities and courage.

We are apt to count only as heritages certain attributes of shrewdness and wealth accumulation. But there *are* country fathers who have neither possessed the one nor acquired the other and whose memory is as green and tender in the hearts of their children as those who have had something tangible written in their wills.

If you disagree with me I have no animus. Perhaps a budget of letters to me on this matter would help me to jump the next hurdle on the yearly round.

PASS THE MURADS

A tabloid newspaper, offering $1.00 each for "embarrassing moment" letters received the following epistle:

"I work on an early night shift in a steel plant. I got home an hour early last night and there I found another man with my wife. I was very much embarrassed. Please send me $2.00 as my wife was also embarrassed.

The editor, so we are told, sent a check for $3.00, admitting the possibility that the stranger, too, might have been embarrassed.—*Exchange.*

Preacher—Dat's as fine a goose as I evah see, Bruddah Williams. Whar did yo' git such a fine goose?

Mose—Well now, pahson, when yo' preach a speshul sermon, I never axes yo' whar yo' got it. I hopes yo' will show me de same consideration.—*Wall Street Journal.*

Peggy—"The man I marry must be brave as a lion, but not forward; handsome as a Greek god, but not conceited; wise as Solomon, but meek as a lamb; a man who is kind to every woman, but loves only one."

Peter—"By jove! How lucky we met!"—*Tit Bits* (London).

Willie was being measured for his first made-to-order suit of clothes.

"Do you want the shoulders padded, my little man?" asked the tailor.

"Naw," said Willie significantly, "pad de pants."

SOUND BUSINESS MAN

Judge: "You can take your choice; ten dollars or ten days."

Prisoner (still in a foggy condition): "I'll take (hic) the money, your honor."—*High Tension News.*

Family Friend: "So your boy got his B.A. and M.A. before leaving college?"

His Host: "Yes, indeed, but his PA still supports him."—*The Enamelist.*

And then there is Rudy Vallee, a Yale graduate, getting his nine thousand a week for singing love songs. It just goes to show what a college education will do for a man.—*Brown Jug.*

"It was terrible," said Mrs. Murphy. "There were twenty-seven Swedes and an Irishman killed in the wreck."

"Indeed," said Mrs. Grogan, "the poor man."—*Wroe's Writings.*

A baseball game being played in Old Man Jones' pasture broke up in the seventh innning in an uproar when Joe Spivis slid into what he thought was third base.

—*Better Methods Magazine.*

Rastus (at dance): "Mirandy, is yo' program full?"

Mirandy: "Lawdy, no! It takes mo' dan two sandwiches and a cup of coffee to fill mah program."

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